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Launched in 2014, the Beeck Center for Social Impact + Innovation is a social innovation startup inside of Georgetown University. Part lab, part think tank and part classroom, we work with practitioners and students to innovate scalable solutions to systemic social problems. Building on Georgetown University’s core values and global reach, we conduct academic research, hold convenings and drive creative thinking around issues at the intersection of data, technology, capital and policy innovation.

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Introduction

21st-Century Infrastructure in Context

The U.S. infrastructure system is in a state of transformation. Much like other major systems now in disruption (from health care to education), current models for how the U.S. builds and maintains vital infrastructure also need to be transformed. The challenges of fiscal distress and siloed government accountability systems are not confined to Flint, Michigan. The estimated backlog of deferred maintenance in the United States for critical infrastructure systems is over $3 trillion, according to the American Society of Civil Engineers.

While maintaining the nation’s aging systems of infrastructure is important, the U.S. also needs to deliver new systems to meet the demands of the 21st-century. By 2045, an additional 70 million Americans will need basic infrastructure like clean water and roads, as well as new essentials like broadband, a distributed electric grid and modern transportation systems.¹ A decade ago, high-speed broadband was a communications luxury. Today it is a fundamental driver of economic growth, a tool for capital access and an essential element of the digital economy.

Despite these complex changes, the key question for policy-makers and the public remains the same. How can investments in public infrastructure yield the highest benefits to the public and deliver measurable outcomes?

This paper looks at how to promote this shift and drive needed public sector innovations in infrastructure policy, regulation, finance, procurement and permitting.

The solution is simple: Government and the private sector must shift national, state and local infrastructure systems toward an outcome-based approach to infrastructure project development and promote life-cycle management of all public infrastructure assets.²
Overview of the Current U.S. Infrastructure System

America’s infrastructure systems are aging and undermining national economic competitiveness. The World Economic Forum’s 2015 Global Competitiveness report ranked the U.S. 12th in the world due to underinvestment in both critical core infrastructure systems (water, wastewater, roads, bridges and ports) and in 21st-Century innovative infrastructure services such as high-speed broadband and energy innovation.¹

In moving toward a performance-based model, here are three key facts and takeaways about America’s current infrastructure system to keep in mind.

FACT #1

Financing infrastructure is not a monolithic system (e.g., water, transportation, ports, utilities). Business models differ by infrastructure type and management, and financing is distributed across different levels of government. Most infrastructure spending (three-fourths) comes from state and local governments, according to the U.S. Congressional Budget Office.

Key Takeaway: Policy makers have an opportunity to shift the system by 1) increasing federal spending to keep the U.S. infrastructure system competitive; 2) focusing federal investment on creating the right incentives for local and state reform.
FACT #2

The core of America’s current infrastructure problem is a consequence of deferred maintenance. There is a strong public sector bias to invest in new capital projects rather than effectively maintaining and extending the life of public infrastructure assets meant to last 30-50 years. The American Society of Civil Engineers estimates over $3 trillion of investment is needed by 2020 to rectify the deferred maintenance backlog.4

Key Takeaway: Public policy needs to consider the life-cycle of the investment. The current project development process in the United States is biased for choosing the lowest cost bid to build a project—not maintain it over its entire service life. Cost efficiency is not the same as cost effectiveness. The tragedy in Flint, Michigan clearly illustrates the problem. Decision makers tried to save a few thousand dollars of maintenance to ensure public health. Their actions will now cost local, state and U.S. taxpayers untold millions. This is the tip of the iceberg. The U.S. needs systemic reform to create incentives for life-cycle management of expensive taxpayer assets.

Deferred Maintenance: The Crisis Is Here and Now

In addition to the Flint, Michigan public health tragedy—and other cases of lead poisoning in U.S. water systems—the very real costs of deferred maintenance are being felt by citizens and businesses right now.

South Carolina Dams (2015)

In October 2015, heavy rainfall and flooding in South Carolina led to the failure of at least 36 dams, causing 19 deaths and the displacement of 20,000 people. After the storm, the U.S. Army Corps of Engineers identified 167 additional dams in need of repairs.

Washington, DC, Metro (2016)

Once the shining model of U.S. subway systems, Washington, DC’s entire metro system recently shut down for 29 hours to deal with a growing safety crisis—mysterious electrical fires that have resulted in injuries and one fatality. The culprit: an estimated 15-year backlog in foregone track and transformer maintenance.

Aliso Canyon, CA, Methane Leak (2015)

A natural gas leak—from underground equipment not inspected since 1976—released methane and other chemicals into the atmosphere for four months, causing the evacuation of 4,400 households in Porter Ranch. Described as the worst natural gas leak in U.S. history, the incident has so far cost SoCal Gas more than $50 million and could cause statewide power outages this summer.5
FAct #3: 21st-century infrastructure systems need innovative methods to reduce waste in the system. If infrastructure owners were to adopt life-cycle efficiency policies across the globe, as well as employ new data and sensor systems to monitor infrastructure, a recent McKinsey study projected net savings up to 40 percent of current investment levels. More specifically, a performance-based approach that scales best practices could save an average of $1 trillion a year in global infrastructure costs between now and 2030. Those savings could be re-invested in cash-strapped communities to help overcome what Moody’s and other public sector financial experts are calling the “new normal” — the dire state of local fiscal capacity limiting infrastructure investment since the 2008 recession.

Key Takeaway: There is a need for a more innovative, system-wide approach for managing our infrastructure systems, to include:

- Developing more effective partnerships. America needs innovative approaches to leverage private sector expertise and create the appropriate incentives for the capital markets to invest in U.S. infrastructure, for instance, engaging companies like Swiss Re as well as other insurance companies on how smart infrastructure designed to avoid future storm damage can be monetized.

- Developing more integrated planning and data systems to better help local, state and federal agencies manage infrastructure. For example, better timing of street repairs, water line repairs and broadband installations could save millions of dollars and reduce business disruption.

The Obama Administration’s Build America Investment Initiative has identified similar opportunities in re-designing the U.S. infrastructure system, by highlighting important federal “principles for outcomes-based predevelopment.”

This paper builds upon this work and offers recommendations on how to create enhanced performance for local, state and regional infrastructure systems.
Making the Shift to a Performance-Based System

As noted, most U.S. infrastructure projects (be it a public university building or a transportation project) are promoted by a single public agency and only the capital costs of the project are initially funded by the governing legislative authority. The winning bid is usually the lowest capital cost bid. Unfortunately, studies show that construction cost escalation for a statistically significant number of analyzed public sector projects ranges between 20% and 45%.9

Little regard is given to the life-cycle costs of the project over its 30-year or more life, which studies show is fueling the nation’s extreme deferred maintenance gap. Even less consideration is given to managing life-cycle operational risks or performance outcomes that drive up project costs.10

What we need, therefore, is a top-to-bottom shift in how U.S. infrastructure projects are funded, maintained, procured and permitted.

To remedy these persistent problems and boost infrastructure innovation, productivity and performance, there is growing interest in new practices and policies to scale up what is being called “performance-based infrastructure.” These methods have been developed extensively in the UK, Australia and Canada in the past 15 years. This model is now being developed in the United States through:

• Creation of regional infrastructure accelerators to help advise public sector agencies on best practices and performance.11
• New asset management methods in the United States to help local and state chief financial officers value infrastructure assets as part of a portfolio approach.12
• Innovative procurement reforms that focus on defining the desired public services that taxpayers are seeking without first proscribing detailed project designs and characteristics.13
• Permitting reforms that are based on new forms of data.
### Infrastructure Project Development: The Current Model is Inadequate

Each public agency sponsors individual projects (roads, wastewater treatment plants, hospitals) based on its own needs assessments and past design concepts.

Project conceived and designed internally to agency; limited consultation with other agencies or the public.

Strong bias for new construction (political ribbon cuttings) over proper maintenance of 30- to 50-year public assets.

Individual projects’ capital costs sought from legislature or city/county council.

Low-bid capital construction contracts win the work; then the public gets to provide largely canned “input” about highly similar project alternatives.

No plan for life-cycle maintenance or performance guarantees on construction.

Frequent cost overruns on construction and infrastructure performance; current deferred maintenance bill in U.S. is above $3 trillion and growing (ASCE, 2013).

More Flints are likely as local and state finances continue to tighten.
Performance-Based Infrastructure (PBI): Defined

While difficult to explain in a seven second sound bite to an inquiring reporter or aspiring legislator, infrastructure projects with the lowest construction costs do not always deliver the best lifetime value to the public. One need only look at recent examples (San Francisco-Oakland Bay Bridge and the Hawaii Transit Line, to name two) where the public is absorbing multibillion-dollar cost overruns for construction and operational risks that could have been shared with the builders.\textsuperscript{14}

By contrast, performance-based infrastructure proponents aim to shift the conversation from its typical starting point of \textit{lowest estimated construction cost} to a new metric—\textit{best overall value to taxpayers}.

Performance-Based Infrastructure

PBI uses methods and techniques to incentivize lifecycle thinking and risk management for expensive taxpayer investments in public works projects meant to last 30 or more years.

\textbf{Public procurement}: PBI uses public project delivery methods that consolidate responsibility for the key phases of a project’s full life cycle—design, construction, and maintenance—into a performance-based contract with a private partner. The physical infrastructure assets remain in public ownership throughout the process. Simplified procurement documents ask bidders to specify their life-cycle performance strategies to meet desired outcomes for the project, rather than simply what it will cost to build it.

\textbf{Public sector budgeting and asset management}: PBI supports the full implementation of Governmental Accounting Standards Board rule 34, which requires local and state chief financial officers to begin reporting the accrued value of their infrastructure assets in their annual financial reports on an accrual accounting basis rather than on a cash basis where the value of all physical assets is off the books once construction is complete. Using accrual accounting, GASB 34 can raise attention to the need for proper maintenance of valuable assets.

\textbf{Public sector risk management and taxpayer investment protection}: PBI emphasizes avoided costs and risk transfer. Effective project risk management from cradle to grave can create additional public benefits when compared with traditional procurement methods—e.g., shorter design and construction timelines, increased cost and schedule certainty, lower total life cycle costs, and long-term performance guarantees.

\textbf{Public-private partnerships}: PBI procurements can sometimes include private sector financing and/or operational responsibility using a “pay for performance” model—i.e., if the private sector doesn’t deliver as promised, it doesn’t get the payments it expected. This pay-for-performance approach, enforced by detailed performance contracts, shifts risks typically retained by the public (performance, cost overruns) over to the private sector.
Performance-Based Infrastructure Overview of Case Studies

The Beeck Center for Social Impact + Innovation is writing a report for the now-forming Northeast Infrastructure Exchange that will be released later this year and feature a number of illustrative case studies and lessons learned in the field.

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Implementing PBI: Lessons Learned to Date

Below are some key findings about what it will take to drive a shift to a performance-based infrastructure system in the U.S.

**LESSON 1**

Countries, regions and states that have committed to create long-term PBI infrastructure investment programs have fared much better than governments which have tried to chase one-time, private investment in a single big project. Given fiscal shortfalls for infrastructure spending, there have been discussions for years in the United States about the idea of attracting public pension fund and other private capital “sitting on the sidelines” to invest in U.S. infrastructure projects and lighten the load on public sector investment. The reality is that building a successful market for what are known as PPPs (public-private partnerships) has largely stalled in the U.S. These investment partnerships have succeeded when government leaders have created full-bore infrastructure programs based on improving lifetime operational performance of all infrastructure investments; Canada alone has accounted for over $100 billion of infrastructure investment since 2002, of which approximately $15 billion is private sector capital. See box below.

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Canada’s Successful Shift to Performance-Based Infrastructure (PBI)

Fifteen years ago, Canada was in the same boat as the United States: a massive infrastructure deficit and a system that was stuck.

Then things changed. The key was shifting to the PBI method that does all the math and making sure that taxpayers were no longer always on the hook for all of the risks of construction and operating a complicated project.

It started in the province of British Columbia, spread to Ontario and Quebec, and now every Canadian province does it this way. New, impartial infrastructure stewards were hired to advise Canadian provincial infrastructure agencies to utilize performance-based infrastructure methods when appropriate. The results: more projects delivered on time, on budget, over 500,000 full-time jobs in the past decade and $100 billion in new projects.

**Evidence**

A report released in 2014 by the Canadian Council for Public-Private Partnerships confirmed that P3s are contributing significantly to Canada’s economy. Based on an assessment of 121 P3 projects over 2003-2012, the report finds that P3 projects across Canada have generated more than 517,000 jobs, $32.2 billion in income, $48.2 billion in total GDP and $92.1 billion in economic output.15

The Altus Group released a report assessing the track record of Infrastructure Ontario’s AFP model that employs P3 methodologies. Out of 37 Infrastructure Ontario projects that have reached substantial completion, the group found that 97% of projects were delivered on budget and 73% were delivered on time or within one month of their planned completion date.16

Notably, Canada’s performance-based infrastructure shift started in the provinces; only recently has the national government created its own center of expertise.
LESSON 2

In most cases, public infrastructure assets should remain publicly held but private sector expertise, innovation and capital can and should be employed when appropriate. There has been ongoing controversy in the United States about whether privatizing publicly held assets is a better way to deliver infrastructure outcomes for the public. Case study analysis in our final report will make clear that in most cases full privatization is neither politically nor economically expedient. That said, private sector innovation, operation and financing of infrastructure projects that remain publicly held assets do offer many benefits to the taxpayer, including transferring substantial operational risks to the taxpayer and avoiding massive cost overruns or for bundling smaller projects together to streamline construction and operational expertise.

LESSON 3

Rather than have the public sector spend time and energy developing complex procurement and design documents, public agencies should shift to performance-based procurements. More innovative thinking and taxpayer value occurs when bidders are asked to look at life-cycle performance and the availability of services without the public sector pre-judging how that will happen and be designed. This process starts with shorter and simpler procurement documents that simply call out how much taxpayers have to spend and what outcomes they seek. Recent examples include the proposed Wichita (KS) wastewater treatment facility and outcome-based procurements for road maintenance and building services in New Zealand.

LESSON 4

To address permitting delays, the public sector should pilot efforts that link project permitting and data innovation to measurable performance.

Estimates of the costs of federal permitting delays to the U.S. economy—in excess of $3 trillion—rival the numbers often cited by the ASCE for the U.S. infrastructure funding gap. While reducing legal and permitting delays is critical, promising new approaches can accelerate better outcomes by using data innovation and systems thinking to measure results across landscapes and river basins. For example, a new water quality trading system approved by regulators in Oregon, Washington and Idaho uses stream bank restoration to meet federal water quality goals at lower costs than expensive new central station treatment costs. Given the national backlog of unfunded wastewater treatment facilities, these and other performance-based innovations could be game changers.
LESSON 5

Public sector infrastructure cost overruns and maintenance costs can be substantially reduced by looking at every element of a project risk to make sure that the right person is managing that problem. Doing this not only cuts project costs to the taxpayer; it opens up financing opportunities by potentially monetizing avoided costs. A key step in the PBI planning process is conducting a risk assessment workshop to identify and assign project risks to the right party. See graphic.

LESSON 6

A final lesson for public sector leaders looking to implement performance-based infrastructure is the importance of multi-modal integration. Current infrastructure funding and finance systems are largely siloed across different modes—water, transit, highways, broadband and the like—which makes it harder to find efficiencies and implement innovation. In many communities, for example, the biggest energy user is often the city’s wastewater treatment plant, and separate power and water utilities operate under different management and financial incentives. The rise of distributed power systems, wireless technology and driverless cars will further strain our current way of managing and thinking about infrastructure, let alone delivering desired outcomes to taxpayers.

Bath (NY) Electric, Gas & Water Systems: Integration and Innovation

In 2015, Bath Electric, Gas & Water Systems (BEGWS) launched an innovative effort to transform its existing wastewater treatment facility into a “resource recovery hub,” capable of turning waste into power. The city’s existing wastewater treatment facility was energy-intensive, released methane and other harmful pollutants into the atmosphere, and expensive to operate. The new resource recovery hub offers an environmentally safe, profitable and self-sustaining option for Bath. The plan will also ensure that the city meets EPA regulations.

Guy Hallgren, director of municipal utilities at BEGWS, predicts that the upgraded plant that integrates water-wastewater and energy operations will result in increased revenues and decreased operational costs. By securing waste disposal business from food producers and restaurants in the region, and selling energy back to the grid, the city will generate revenues to pay back the 30-year, $15.5 million state bond needed for the upgrade.
Recommended Shifts for State and Local Leaders

For cities, states and regions interested in accelerating the use of performance-based infrastructure, the following 10 action and policy recommendations can help build a new PBI program:

**Assessment and Research**

1. **Conduct an assessment and inventory of your jurisdiction’s current tools and authorities available to implement performance-based infrastructure.**
   
   For example, over 30 states have infrastructure banks but in most states these authorities don’t apply to infrastructure modes outside transportation.\(^{26}\) Keep in mind that passing new legislation, such as creating a new state infrastructure bank, can take time.\(^{27}\) While assessing these options, other executive actions, budgeting reforms and innovation incentives that are available to begin shifting agency project planning toward an outcomes mindset.\(^{28}\)

2. **Meet with your city and state’s municipal finance experts and the state treasurer’s office to assess long-term needs, gaps and efficient use of existing revolving loan funds.**
   
   The primary financing tool that finances infrastructure in every community is municipal bond financing, created in 1914. As your community projects future capital and infrastructure needs, understanding the gap between future bonding capacity and actual needs is essential to determine. For example, the California treasurer’s office just released an excellent report estimating the state’s infrastructure funding gap to be $358 billion over the next 10 years and proposing a number of action steps to close the gap.\(^{29}\)

   **3. Create a plan for cutting deferred maintenance, boosting enhanced infrastructure efficiency and closing your infrastructure funding gap.**

   Traditional municipal bonding authorities are not organized to measure whether or not your asset is well-maintained or subject to a pay-for-performance payment to protect taxpayers from construction or operational risk. But elected leaders and chief budget officers should fill this management gap.\(^{30}\) Notable here: North Carolina voters recently approved a $2 billion state infrastructure investment program anchored by the governor’s commitment to maintaining existing infrastructure better and instituting fee-for-performance initiatives.\(^{31}\)

**Key Performance-Based Infrastructure Reforms**

4. **Require an Infrastructure Risk and Resilience Assessment (IRRA) for major projects:**

   Governors, mayors, state legislatures and local governments should consider requiring life-cycle cost and risk analyses of all new taxpayer investments in public infrastructure above $25 million to ensure that both capital and O&M costs are considered for the life of the asset. These IRRAs can also be implemented through legislation, executive orders and budgeting incentives. These critical early project assessments can also serve as a first chance for the state’s budgeting team to assess exactly what outcomes and services are to be purchased; whether innovative design and data could be applied to reduce long-term operational risks and costs, and if there is cross-agency duplication. Typically these reviews are conducted by the CFO, state treasurer or Ministry of Finance\(^{32}\) but they can also happen voluntarily when far-sighted agencies add them to procurement requirements.\(^{33}\)
5. Institute 10-year infrastructure investment plans: State legislatures, city councils or county councils should work with their governor to develop a 10-year infrastructure project investment plan to promote long-term integrated planning and investment across individual infrastructure modes that are now siloed. Infrastructure Ontario is a great example where developing this plan changed the game from an annual budget skirmish about whose project would be on the funded “list” to instead building a more deeply vetted long-term pipeline of projects focused on life-cycle costs and benefits.34

6. Fully Implement Governmental Accounting Reforms for Smart Asset Management. Approved in 1999, rule 34 of the Governmental Accounting Standards Board establishes new financial reporting requirements for state and local governments throughout the United States. A key aspect of GASB 34 is its call for accrual accounting of governmental assets and liabilities, including infrastructure. Unlike government, most utilities and private sector companies use accrual accounting. Elected officials should encourage local and state CFOs to fully implement GASB 34 as a critical step for cutting deferred maintenance and protecting the value of important public assets.

7. Pilot the use of new outcome measures and business case tools in the development of performance-based infrastructure procurements. Canada's Sea to Sky Highway simplified procurement asked bidders to achieve seven transportation outcomes using a total of $600 million. Innovative responses and designs provided $700 million in measurable value, more than expected. More recently, the San Francisco International Airport Terminal 1 project required project bidders to do a triple bottom line business case analysis as part of their submission. These simple no-cost changes to public sector procurement could be transformative if adopted across the country.35

8. Public sector training and engagement are critical for the success of PBI. Shifting to PBI involves big changes for most governments to make, and bureaucratic, agency and legislative incentives now in place generally discourage new approaches. To have a chance of success, performance-based infrastructure and risk management tools and expertise should be made readily available at low or no cost to all public infrastructure project sponsors interested in using these methods.36

9. Incorporate new resilience data, design and disaster planning tools. Extreme weather and storms are costing insurance companies and ratepayers an extra $150 billion per year worldwide. As a result, new tools to monetize avoided storm damage are being piloted by Swiss Re, MyStrong Home and other insurance companies.37 The Department of Homeland Security is working with Northeastern University, the West Coast Infrastructure Exchange and others to educate local officials about regional resilience and infrastructure asset management.38

10. A new role for the public and communities is needed for 21st-century infrastructure innovation. The mismanagement and public health disaster in Flint has shone a new light on the need for more meaningful public participation and attention to proper infrastructure maintenance. Not unrelated, citizens and small businesses interested in using new forms of distributed energy sources are increasingly coming into conflict with the desires of longstanding public utility monopolies that consider these changes disruptive to their business model. While PBI is not a panacea for all society's ills, a key feature of the work is the creation of transparent decision-making processes that can help meet these challenges and focus the debate on outcomes.
Performance-Based Infrastructure: The New Model

As part of normal needs assessment, project sponsors and public sector leaders look at alternative approaches and partnerships for delivering optimum infrastructure outcomes; CFOs track asset condition.

Public/community/business plays an early role in identifying alternative strategies to realize the same or better outcomes; best-in-class designers compete for project outcomes based on innovation and performance guarantees.

Enhanced focus on how new distributed models to deliver transportation, energy and water savings overlap and interplay for new efficiencies.

Project added to a 10-year infrastructure asset management plan approved by the legislature, prioritized based on compelling need and benefit.

Legislature requires an Infrastructure Risk and Resilience Assessment (IRRA) to ensure taxpayer investment minimizes life-cycle project management risks and enhances performance.

An enforceable plan exists for performance guarantees on construction, to prevent cost overruns and provide for life-cycle maintenance.

Strong on-time, on-budget construction results plus infrastructure assets are better maintained as taxpayers pay agreed-upon costs to contractors only when infrastructure assets are available and meet performance requirements.

Better outcomes for taxpayers and communities measured in net costs, controlled risk, better design, climate resiliency and equitable community investment outcomes.
Bringing PBI to Full Realization: Create a Center of Expertise to Anchor the Work

The top 10 list of PBI reforms above involves a number of complicated, multi-year changes. Taking any of these steps is a good idea for public sector leaders who want to begin realizing better value for taxpayer investment in infrastructure and drive public sector innovation.

Given this paper’s earlier finding regarding the value of programmatic reform rather than single project success, most experts recommend that PBI work ultimately be anchored in one place by creating a center of expertise to serve a metropolitan area, state or region.

Infrastructure Accelerators Explained

According to the U.S. Congressional Budget Office, most of the over $500 billion in U.S. annual infrastructure spending happens at the state and local level, but most infrastructure projects cross political boundaries. The objective of the infrastructure accelerator model is to facilitate project development through a uniquely flexible metro/regional platform.

The accelerator model does this by serving as the translation point between the public and private sectors: public sector decision-makers leverage the accelerator to develop best practices and access expertise in project financing they currently lack, while potential investors and stakeholders have welcomed the accelerator’s efforts at developing standards common to multiple projects and infrastructure types.

Accelerators are intended to anchor a major shift in public sector infrastructure development practices, productivity and performance in a number of key areas, including:

- Helping localities utilize outcome-based and life-cycle infrastructure methods to ensure project risks are properly allocated and key outcomes like enhanced infrastructure resilience are realized.
- Providing assistance with critical predevelopment activities such as feasibility analysis, stakeholder engagement, data innovations and other best practices.
- Breaking inter-agency silos and finding integration opportunities between capital projects and investments.39
• Acting as an owner-advisor to public agency project sponsors to help assess how and when to engage private sector expertise and capital into complex public infrastructure projects (the use of traditional PPPs).

• Instituting models of transparency for procurement reform and clearly defined criteria for doing business case analyses of taxpayer value for money for projects of a certain investment size or type.

• Bundling smaller-scale and distributed “green infrastructure” and rural projects into outcome-based and efficiently scaled projects.

• Developing meaningful 10- and 20-year infrastructure investment programs that reflect best practices in asset management (GASB 34).

The goal of accelerators is to serve regional interests through the planning, delivery and oversight of complex infrastructure projects using innovative approaches. As an example, British Columbia has implemented a regional accelerator model as part of its infrastructure delivery system in Canada. The end result is that Partnerships BC, Infrastructure Ontario and other Canadian accelerators have accounted for over $100 billion of infrastructure investment since 2002, of which approximately $15 billion is private sector capital.40

As importantly, these centers of expertise have shifted public sector focus from funding just the upfront capital costs of a project to a new model called “performance-based infrastructure” where the full life cycle of operation and operating risks, including resilience issues, is considered upfront.

Most recently, the California treasurer has called for the creation of such an accelerator in his state,41 and other experts are advocating for expansion of similarly conceived intermediaries.42
Infrastructure Accelerators in the U.S.

In its early adolescence in the United States, the infrastructure accelerator movement is beginning to serve as a critical resource for infrastructure development and planning—providing a unique opportunity to embed standards, budget reforms and other best practices for system-wide implementation.

In the United States there are currently six PBI-accelerators and more are likely to form under Section 1441 of the FAST (Fixing America’s Surface Transportation) Act.
Regional Infrastructure Accelerator Pilot Program

Section 1441 of the FAST ACT, enacted in December 2015, establishes a competitive grant program to demonstrate the concept through at least five state or regional infrastructure accelerator programs.

Regional accelerators will:

• provide assistance with predevelopment activities and costs such as feasibility analysis, stakeholder engagement, permitting road maps, etc;
• screen local projects seeking national support or national technical assistance;
• ensure multi-modal integration;
• institute models of transparency such as standardized processes and clearly defined criteria for infrastructure investment projects;
• utilize performance-based infrastructure methods to ensure product risk is properly allocated;
• bundle smaller-scale and rural projects into investable project pools;
• commission and review Value for Money analyses;
• prepare and review requests for qualifications and proposals from private sector partners; and
• apply regional approaches for advancing innovative investment in public infrastructure projects that span all types of infrastructure including surface transportation, freight infrastructure, ports, inter-coastal waterways, clean water initiatives, water storage and irrigation, and others.
The Federal Role: Capacity Building and Standard Setting

The U.S. infrastructure system is in the midst of profound transformation. The long-term effects of decades of deferred maintenance and local fiscal challenges are revealing themselves in dramatic new ways, from Flint’s water crisis to the massive Porter Ranch methane leak to the closure of the Washington metro system in March.

New 21st-century challenges, needs and opportunities—from big data, disruptive weather and distributed electricity generation—are also challenging the public sector to innovate, or else.

Successful models for building and funding new infrastructure are out there, and new methods to get more taxpayer bang for the buck and private investment in public infrastructure have been developed in other countries and regions, including Canada. These new methods, including performance-based infrastructure and procurement innovation, are proven methods.

Yet as discussed in this Working Draft, these infrastructure innovation tools remain highly underdeveloped in the U.S. and need to be scaled.

So what is the federal role in incentivizing the use of PBI? Here are a few recommendations to supplement those already made by the Build America Investment Initiative and others:
PHASE 1: 2016-2017

Begin Building a PBI Infrastructure Accelerator Network from the Bottom Up

Although last year the Canadian national government authorized the creation of a national infrastructure center of expertise, the growth of the performance-based infrastructure system began at the local and provincial level in 2002. Partnerships BC led the way as it faced the challenges of financing new infrastructure for the coming Winter Olympics; Ontario followed suit after a $400 million stadium cost overrun crowded out funding for other critical infrastructure. Now about 10 provincial centers are advancing performance-based infrastructure and attracting private sector capital into public infrastructure projects.43

Mimicking this bottom-up growth makes sense for the U.S. as well, as over two-thirds of all infrastructure projects are funded and sponsored at the local and state levels. But as expert studies have shown, there is limited to no capacity or skill set for PBI.

It is recommended therefore that the federal government take steps to support the shift to PBI from the bottom up with initial capacity, grants and dissemination of best practices. Performance-based infrastructure and risk management tools and expertise should be made readily available to all public infrastructure project sponsors interested in using these methods. At scale, in 10 years, the U.S. would rely on a local, state and regional network of accelerators to support this shift to performance-based infrastructure.

Building a Better U.S. Infrastructure System from the Bottom Up

5. The result: a growing national marketplace of projects attractive to investors

4. New infrastructure accelerators acting as project intermediaries strengthen local and state project quality, delivery, cost to taxpayers

3. A single center of expertise in local/state government is most efficient way to assess project alternatives, including private financing and small project bundling

2. Success in Canada and elsewhere suggest key is considering life-cycle costs and benefits not just capital costs of each project

1. Local and state agencies originate projects but lack capacity and expertise to look at alternative procurement and financing methods
PHASE 2: 2017-2018

Link Federal Infrastructure Finance Centers and Local Infrastructure Accelerators through Best Practice Incentives

One major outcome of the administration’s Build America Investment Initiative in the past 18 months has been the creation of new infrastructure best practice and finance centers at the following federal agencies: EPA, DOT, DOI, USDA, and the DOE.

To further leverage this federal investment, linking these Federal Finance Centers to the emerging network of metro and regional accelerators created by Section 1441 of the FAST Act could help extend the reach of these centers and serve more local project sponsors in the process. Key to long-term success will be to condition federal support of regional accelerators and local project sponsors on having PBI reforms in place.

Access to PBI predevelopment support in Federal Finance Centers and regional accelerators could depend, for example, on local project sponsors doing 10-year capital plans, new forms of community engagement, procurement and permitting reform and conducting/funding an Infrastructure Risk and Resilience Assessment.

Future U.S. Infrastructure System

Federal Government Agencies and Finance Centers

Growing Network of Local, State and Regional Infrastructure Accelerators

Local and State Infrastructure Project Sponsors and PBI Partnerships

Incentivize PBI Best Practices

Network Provides Expertise and Performance-Based Support to Project Sponsors
PHASE 3: 2017-2020

Additional Federal Reforms

The next president and Congress will clearly have their own ideas about infrastructure funding and finance, but it would be a good idea to make sure that the U.S. public sector continues to shift toward life-cycle management of infrastructure assets. In addition to supporting the growth of the PBI field, local and state incentives for reform and standing up a network of regional accelerators, here are six more areas of federal reform that could create the outcomes we seek: a more efficient U.S. infrastructure system.44

• Create a predevelopment innovation fund to incentivize the use of performance-based infrastructure methods and the creation of local, state and regional accelerators.

• Support new state training programs to promote better utilization of state revolving funds for water.

• Create flexible forms of federal technical assistance to support implementation of the Governors’ Accord for a New Energy Future (see http://governorsnewenergyfuture.org/).

• Support efforts by the Department of Homeland Security to implement additional regional infrastructure resilience reviews.

• Fund research on infrastructure data innovation and best practices, including full value capture for public investments in transit.

• Link innovative efforts in performance-based infrastructure procurement to the future work of the Federal Infrastructure Improvement Council created by the FAST Act of 2015.
Conclusion

By design, this paper has looked at what the public sector can do to innovate and be more efficient by shifting to a performance and outcomes mindset on infrastructure.

But what about private sector and community partners who care about infrastructure innovation and making sure that their community infrastructure assets are well managed? Should they just sit on the sidelines—or can they engage, and if so, how exactly?

For decades, the U.S. public sector and political system have struggled with the development of so-called infrastructure public-private partnerships. PPPs have been controversial for a number of reasons, driven mostly by a misunderstanding and misuse of the tool.

To proponents of 21st-century performance-based infrastructure, PPPs represent a tired debate we need to leave behind about whether private sector capital and ownership should substitute for public ownership and operation. Our future focus needs to be different: strengthening the effective management of public infrastructure assets and identifying exactly what infrastructure outcomes public dollars can buy, in partnership with private sector experts and community partners.

For proponents of public-private partnerships and public pension fund investment in U.S. projects, there is nonetheless good news here in the move to PBI methods. Over time, the proposed PBI reforms identified in this paper will create another outcome: strengthening public sector capacity to build a better pipeline of potentially investible deals.45
Appendix: Interview List

In developing this paper, we consulted a number of experts whose insights and experience have added great value to our first working draft. Additional interviews are in process and will be further reflected later this year in our full report for the Northeast Infrastructure Exchange.

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<th>Interviewee</th>
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<td>Don Sherman</td>
<td>American Council of Engineering Companies</td>
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<td>Dan Pedrotty</td>
<td>American Federation of Teachers Investments</td>
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<td>Marcia Hale</td>
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<td>Clifford Ham</td>
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<td>Al Puchala</td>
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<td>Nathan Music</td>
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<td>Robert Kolasky</td>
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<td>Jane Silfen</td>
<td>Encourage Capital</td>
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<td>Alex Eidson</td>
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<td>Anthony Williams</td>
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<td>Emeka Moneme</td>
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<td>Joe Whitworth</td>
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<td>Michelle Moore</td>
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<td>Harriet Tregoning</td>
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<td>John Williams</td>
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<td>Bill Butera</td>
<td>Institute for Sustainable Infrastructure</td>
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<td>Zach Schafer</td>
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<td>Judson Greif</td>
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<td>Larry Blaine</td>
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<td>Alex Bernhardt</td>
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<td>Stephen Flynn</td>
<td>Northeastern University</td>
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<td>David Caplan</td>
<td>Ontario Minister of Infrastructure (fmr)</td>
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<td>Samara Barend</td>
<td>Performance-Based Building Coalition</td>
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<td>Eric Letsinger</td>
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<td>Shalini Kapadia</td>
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<td>Susan Tinker</td>
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<td>Denis Hughes</td>
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<td>Jonathan Trutt</td>
<td>West Coast Infrastructure Exchange</td>
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Endnotes


2. For more on the Beeck Center’s approach to public sector innovation and creating an “outcomes-mindset” in government, see our reports at http://beecokener.georgetown.edu/.


10 Additional factors undermining infrastructure productivity and performance include persistent biases in forecasting, biases toward building new rather than getting more out of existing assets, and a huge capacity and skill shortfall in local and state government to improve project delivery and focus on outcomes. Dobbs et al., “Infrastructure Productivity.”


12. See “Summary of Statement No. 34: Basic Financial Statements—and Management’s Discussion and Analysis—for State and Local Governments,” Governmental Accounting Standards Board, June 1999, which requires government CFOs to use accrual accounting and track infrastructure asset value. The GASB chairman characterized the statement as “the most significant change to occur in the history of government financial reporting.”


17. In 2008, the City of Chicago struck a deal with a consortium led by Moegen Stanley to lease the city’s parking meters for 75 years for $1.6 billion. The agreement resulted in a significant hike of meter rates, changes in hours of operations, meter malfunctions, traffic congestion on side streets, all leading to public outrage over the deal. For more, see David H. Hoffman, “Report of Inspector General’s Findings and Recommendations: An Analysis of the Lease of the City’s Parking Meters,” City of Chicago Office of the Inspector General, June 2009.

18. As noted, many experts believe that the new San Francisco-Oakland Bay Bridge is a perfect example of where PBI would have protected the taxpayer.

19. Pennsylvania bridges (lead contractor: Plenary Group) and the Alberta school district (lead contractor: AECOM) are two excellent examples of this method.


24. See “Leveraging Catastrophe Bonds.”


27. Recent examples include the Rhode Island Infrastructure Bank, the NY Green Bank and the Connecticut Green Bank.

28. For example, Executive Order No. 12-17: Infrastructure Planning and Investment, Office of the Governor, State of Oregon, November 13, 2012, which created new budgeting incentives and offered agencies extra inclusion points in the state’s capital budget for doing life-cycle assessments in agency budget requests.

29. “Building California’s Future Begins Today: Modernizing Public Finance and the Treasurer’s Office,” Office of the State Treasurer, State of California, February 2016, http://www.treasurer.ca.gov/publications/biennial/2016.pdf. The California treasurer recommended the state annually track these four factors: (1) condition of infrastructure assets; (2) estimate of when they may wear out; (3) replacement cost; and (4) cost of deferred maintenance.


32. The recent California treasurer’s report is blunt in assuring the need for action, stating that: “public agencies have historically failed in their efforts to identify, parse and measure project risk.”

33. SFO Terminal 1 bid specifications explicitly call for bidders to conduct a comprehensive business case and value for money analysis of all economic, social and environmental risks and benefits. SFO specifically recommends the use of Autocase.com tool. Another assessment tool in wide use is the Institute for Sustainable Infrastructure’s Envision tool.

34. Infrastructure Ontario (IO) was created after massive cost overruns on the Toronto Blue Jays Stadium wiped out a $400 million infrastructure pipeline for smaller projects. IO primed the pipeline with an initial five-year investment plan totaling $1 billion; now the agency maintains a 10-year list of projects above $100 million that have received a life-cycle review.


37. MyStrongHome is a new benefit corporation that fortifies houses against hurricane and storm risk, in partnership with insurance carriers that provide substantial discounts to the properties after they’ve been mitigated. MSH uses the insurance savings as a payment stream, turning a cost center for homeowners into an investment in their homes. MSH has started operations in South Carolina, Louisiana and Alabama and has found that state regulatory environments are key to the viability of its operations.


39. A couple of illustrative examples: (1) agencies should dig once, not three times, to install new broadband, sewer, and power lines; (2) usually the biggest power user in a region is the wastewater treatment plant, so finding ways to share revenues and savings to generate better outcomes is critical.


41. “Building California’s Future.”


43. Expert Interviews, 2016

44. A number of additional and useful recommendations for overhauling the U.S. infrastructure model can be found in “Bridging the Gap Together: A New Model to Modernize U.S. Infrastructure,” Bipartisan Policy Center, May, 2016.
