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Report

Prioritize people, not projects: Addressing the harms of legacy infrastructure in the COVID-19 recovery

Joseph W. Kane and Shalini Vajjhala Thursday, December 17, 2020

Editor's Note:

This brief is the first of a two-part research series. Click here to read the second research brief.

As the COVID-19 pandemic and recession drag on, millions of households are looking to Washington for answers. State and local leaders have led their own recovery efforts, but there is still desperate need for another federal relief package. But even if another short-term federal relief package materializes, there remains a need for a long-term recovery agenda that can provide greater economic certainty and promote more widespread economic opportunity.

Infrastructure investment offers one way to stimulate the economy that continues to elicit bipartisan support. Upgrading roads, ports, pipes, and other facilities can boost capital spending and create jobs now, plus support long-lasting career pathways and durable economic growth. These improvements also stretch across all types of regions, from urban to suburban to rural communities. The recent election of Joe Biden (aka "Amtrak Joe") has further raised hopes for action despite a likely divided Congress.

But to truly improve the country's infrastructure and help the most vulnerable households, federal leaders cannot simply throw more money at shiny new projects. Instead, they must invest with purpose and undo the harms of our legacy infrastructure systems. Too often, households have struggled to afford water and energy bills, to physically reach jobs, or to plug into the internet. This is no accident: Systematic disinvestment, environmental injustices, and racial and economic exclusion have led to infrastructure systems that have posed barriers to opportunity for decades. COVID-19 has only brightened the spotlight on these legacy failures.

Building back better should not only mean building more; sometimes it should also open the door to building less or building differently to better meet the needs of communities. Above all, leaders should prioritize people over projects in our infrastructure plans. In practice, that means defining, measuring, and addressing our infrastructure challenges based on the needs of users of new *and* existing systems.

This brief explores the country's legacy infrastructure needs in greater depth by defining the types of inequities that have emerged over time, the escalating costs households face, and considerations for future policy action. A second brief highlights specific federal, state, and local strategies that can mobilize action during the COVID-19 recovery.

Defining legacy infrastructure

Legacy infrastructure systems include roads, pipes, telephone lines, power plants, and transmission lines that were originally designed to provide greater capacity and connectivity, but have also perpetuated inequities in our built environment. In other words, they leave a legacy of harm—threatening health and safety, acting as barriers to economic opportunity, and introducing environmental hazards. These systems include infrastructure that is already in place as well as new infrastructure expansions—bigger highways, for instance—that further cement historic inequities and continue to fail to meet the needs of underserved residents.

Policymakers, planners, developers, and other leaders have frequently overlooked or intentionally disregarded the needs of lower-income households and communities of color when building and maintaining our infrastructure. For example, our transportation and land use policies continue to value highways and low-density, car-centric development, which have long divided and segregated communities based on income and race. Mid-20th-century highways sliced through historic urban cores from Syracuse, N.Y. to San Francisco, and stretched distances for reaching jobs, housing, and other services. Exclusionary zoning of various kinds widened these divides, preserving wealth and opportunity for predominantly white, upper-income neighborhoods while creating additional spatial hurdles for residents who struggled to afford cars and lacked other safe, reliable options to get around.

These inequities continue to pervade many regions. Robert Moses, New York City's master builder from the 1920s to 1960s, is perhaps the most well-known example of a leader who delivered major projects but prioritized designs that displaced and divided many communities in the process. Since those highways are still in operation and lost family wealth has not been restored, the legacy of Moses' projects is still with us. While leaders in other states and localities have not followed the exact same path as Moses, they continue to build and maintain infrastructure that leaves many people behind or puts them in harm's way. North Carolina is still expanding highways through communities and sensitive habitats; Houston is still constructing homes in vulnerable floodplains; and Los Angeles still depends on port traffic that generates enormous air pollution for nearby low-income neighborhoods.

Over time, the result has been a widening infrastructure gap within and across regions, where individuals may experience drastically different realities depending on where they live. Our infrastructure fails to provide reliable and equitable service, especially in localities faced with changing populations, growing climate threats, economic divides, and technological demands. While metro areas such as Seattle, Atlanta, and Boston have many infrastructure challenges, their sustained economic growth and fiscal capacity (pre-COVID-19) have allowed them to invest in more accessible transit options, cleaner water, and digital services. The same cannot be said for slower-growing, fiscally constrained regions.

Flint, Mich. embodies many of these concerns. An older industrial city that has seen its population and economy plummet over the last few decades, Flint depends on aging, inefficient infrastructure that is not only costly to maintain, but jeopardizes the well-being of its lower-income residents. Nearly five years have passed since Flint's water crisis rippled nationally. Lapses in state oversight and infrastructure maintenance resulted in thousands of lead poisonings, eventually leading Michigan to finalize a $600 million settlement with victims. The significant and lasting health, environmental, and economic impacts to residents and businesses left no real winners.

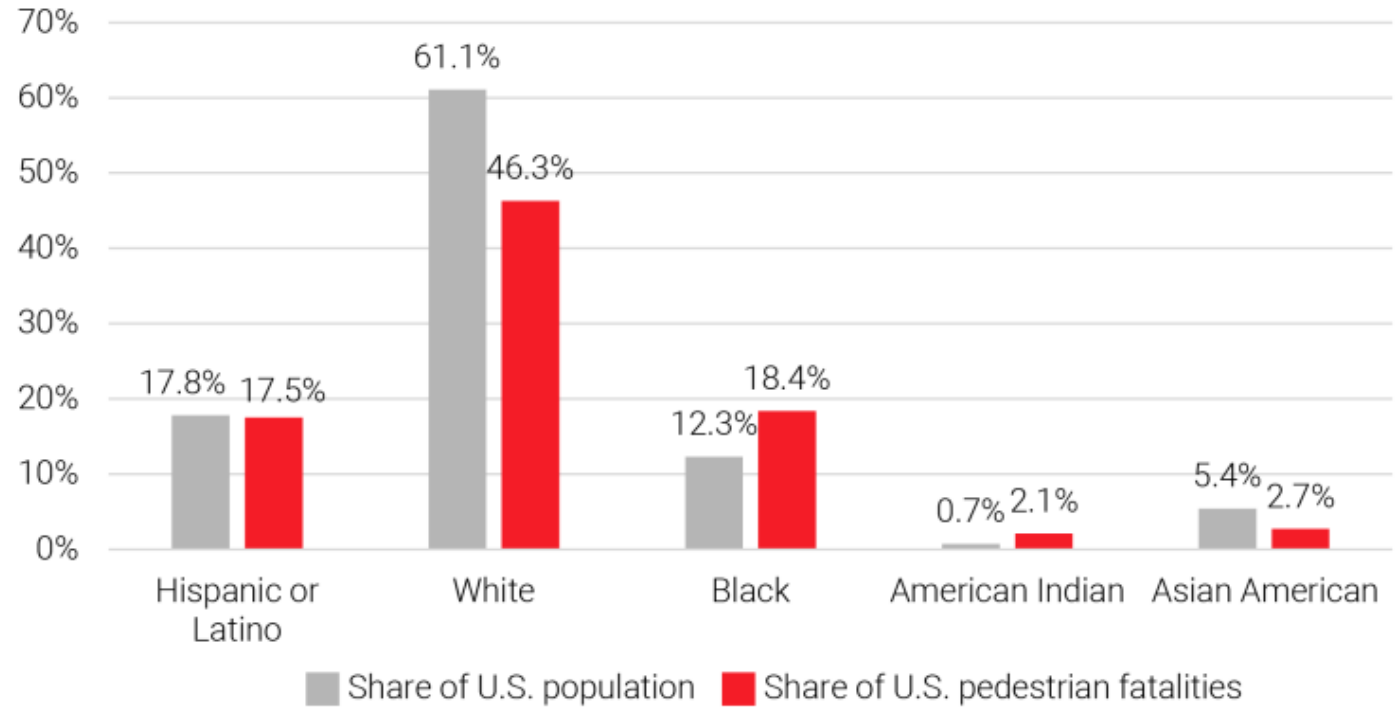
Our infrastructure systems have failed the residents of Flint and continue to leave a legacy of harm in other communities across the country. And the costs—to our health, environment, and economic livelihood—are only increasing.

Recognizing legacy infrastructure costs

Infrastructure is designed to be long-lived. As a result, both the benefits and harms of major projects are also long-lasting. Since we still typically do not plan or measure our infrastructure needs around broad or rapidly evolving sets of concerns—from transportation access to utility bill affordability to climate resilience—many people are bearing higher health, economic, and environmental costs of legacy infrastructure. The COVID-19 pandemic has simply highlighted the higher dangers and costs some of us face, which have been decades in the making.

Legacy infrastructure's dangers to our health and safety are widespread, with our transportation systems producing some of the costliest and deadliest outcomes. Inequitable access to transportation—including a lack of transit and walkable options—forces households to buy and maintain cars, which pose a variety of health hazards. Widespread injuries and death are a daily reality in lower-income communities where a mix of elderly and younger residents must navigate streets that are dangerous by design. Black pedestrians often live in neighborhoods without sidewalks, bike lanes, or other street improvements, putting them at heightened risk of death: They account for 18.4% of all pedestrian fatalities, despite making up 12.3% of the U.S. population. Native Americans also face significantly higher pedestrian fatality rates (2.1%) compared to their population share (0.7%).

Figure 1. Share of pedestrian fatalities, by race, 2014 to 2018



Source: Brookings analysis of Census Bureau and National Highway Traffic Safety Administration data.

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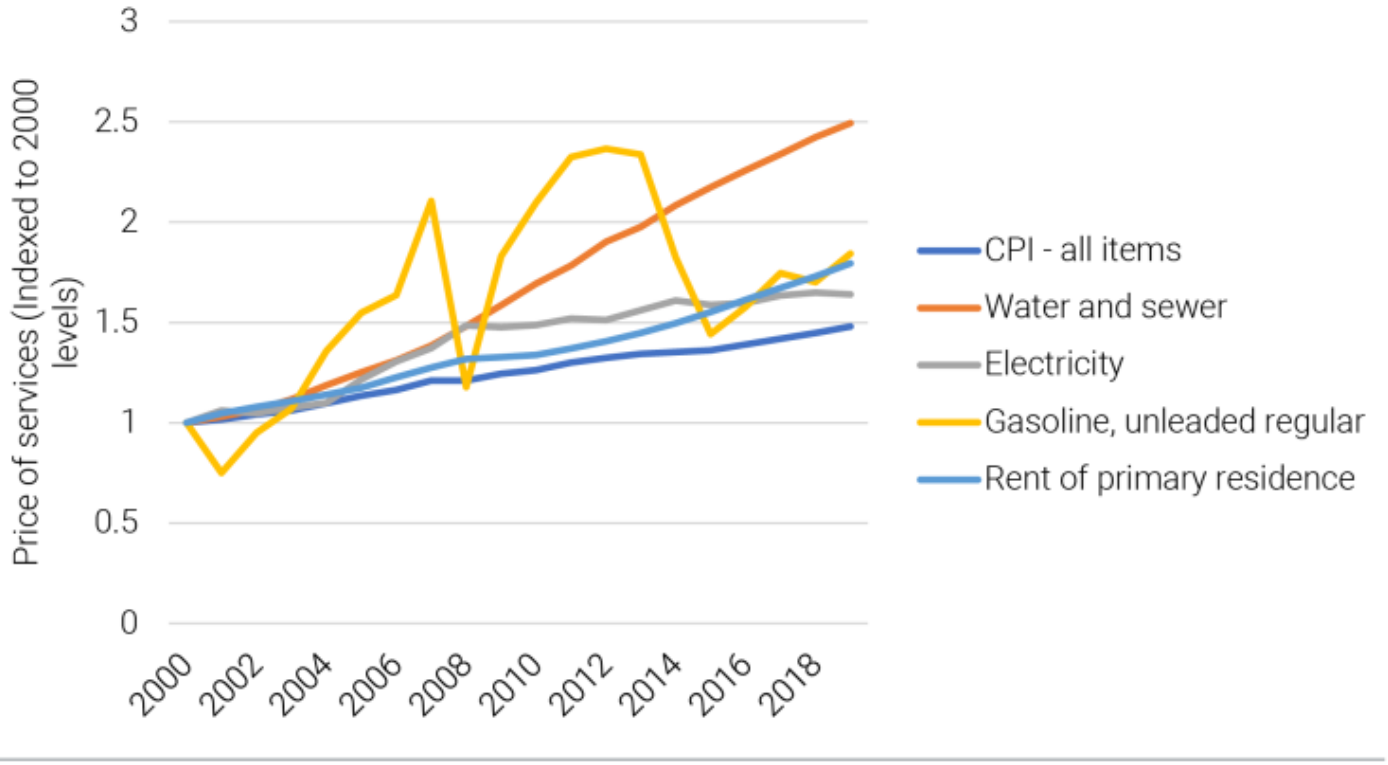
It is not just an inaccessible and dangerous built environment that perpetuates inequities; the lack of affordability prevents many people from drinking clean water, getting reliable electricity, and depending on other essential services too. Since 2000, water and sewer prices have more than doubled in relative terms, while electricity prices have surged 64%—both surpassing the 48% increase across all items according to the Consumer Price Index. Although harder to measure, the price of wireline and wireless broadband has also been a concern. When combined with increases in housing, gasoline, and other infrastructure-related expenses, households—particularly lower-income households—are struggling to keep up.

Figure 2. Indexed change in the price of selected infrastructure services, 2000 to 2019



Source: Brookings analysis of Consumer Price Index data, seasonally adjusted. Prices are based on monthly changes.

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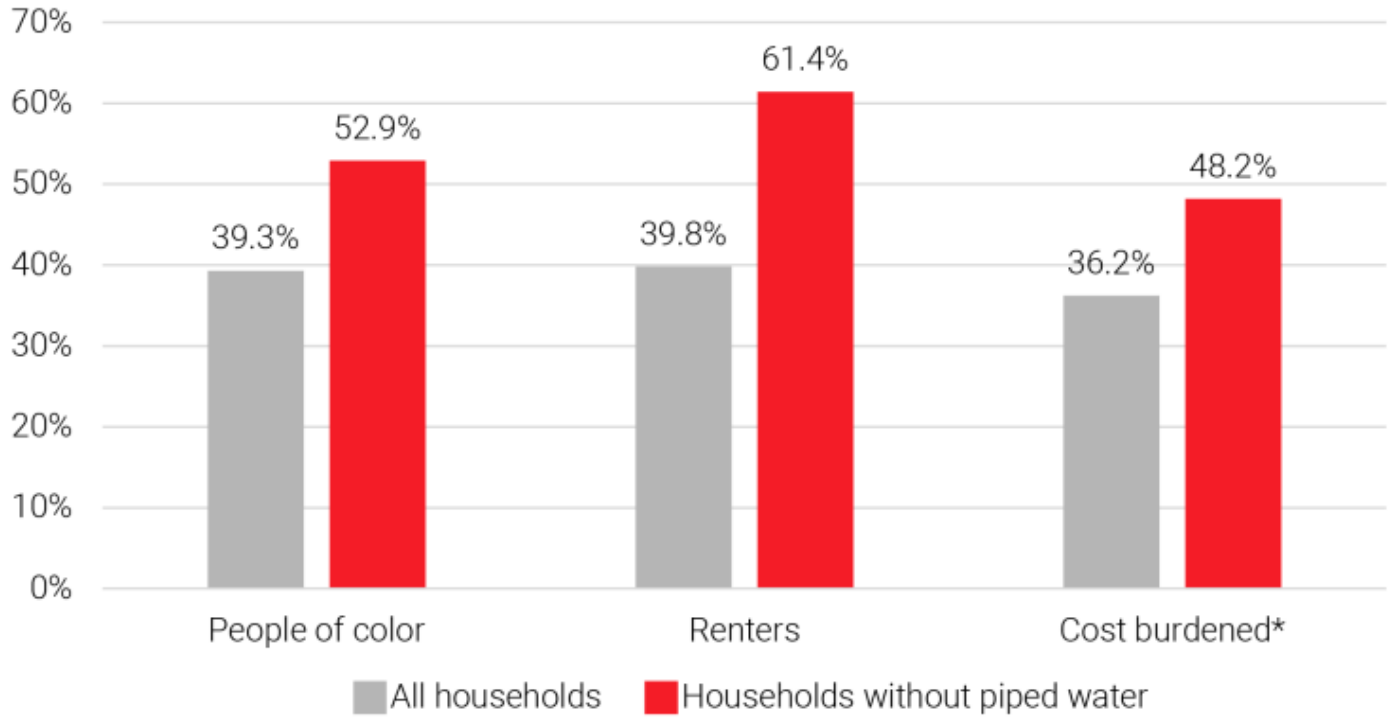
Lower-income households and communities of color have also faced disinvestment, displacement, and outright destruction amid the COVID-19 pandemic and a changing climate. Home values in majority-minority neighborhoods have historically lagged behind those in white neighborhoods, perpetuating decades of property devaluation, neglected infrastructure, and environmental injustices. In addition to greater air and water pollution, these neighborhoods also tend to face more intense heat and flooding, while a lack of parks and green space—combined with extensive pavement and impervious surfaces— worsen these dangers. And increasingly, lower-income households of all races and in all places are the most vulnerable to losses in jobs, wages, and properties due to destructive floods and other sudden economic shocks. Even the lack of basic services remains an ongoing challenge; more than 1 million people—including many people of color, lower-income households, and renters—lack secure water access and are in "plumbing poverty," making it hard to maintain good health and hygiene during the pandemic.

Figure 3. Selected characteristics of households without piped water, 2013 to 2017



Source: Analysis of Census Bureau data in Geographies of insecure water access and the housing–water nexus in US cities by Katie Meehan et al.
*Note: Percentages include households in the 50 largest U.S. metropolitan areas. *Cost-burdened households pay more than 30% of their gross income to housing costs.*

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These costs are only a sampling of the wide harms of our legacy infrastructure. For example, lower-income rural localities and tribal nations continue to face the most serious drinking water quality issues due to a lack of funding and attention. Wastewater, stormwater, and flooding challenges hit both lower-income rural and urban areas hard as well. Rising energy costs—including electric bills—remain a burden on lower-income households, which struggle to avoid shutoffs and get assistance. And broadband gaps are not only prevalent in lower-income, difficult-to-reach rural localities and tribal nations that lack available service, but are increasingly seen as a form of digital redlining in urban areas as well.

Laying the groundwork for more equitable infrastructure investment

Now more than ever, we need to address the inequities of our legacy infrastructure systems. This is not to say that we do not need significant new infrastructure investment—we do. But we've seen how making opportunistic cost-cutting infrastructure upgrades that rely on the same underlying designs can create further harm, as in the case of Flint.

Any national infrastructure plan during the COVID-19 recovery should not just look to build more of the same or perpetuate existing inequities. Federal leaders need to partner with state and local leaders to better define what systems should stay, what should improve, and what should go altogether. There is no such thing as a "shovel-ready project," and the temptation to focus on quick wins may compel us to overlook our legacy infrastructure needs—leaving more people and places behind. Addressing our legacy infrastructure will require new ways of talking about local infrastructure needs and ultimately acting on them at both a local and national level.

- ***A new way of talking about infrastructure needs and investments*:** Our national infrastructure discussions are largely fragmented by sector and federal budget categories. Taking a place-based and people-first approach will require an overhaul of how we engage communities around local infrastructure needs and priorities. No one needs a highway—they need to get to work or school. Re-centering conversations around needs, outcomes, and services rather than projects or assets—especially in this time of rapidly changing needs—is an essential first step.

  Current infrastructure development processes are mostly reactive. Project developers—public and private—take on the risk of doing early design development and feasibility studies, sometimes at great cost, and then present "alternatives" to communities and residents. The result is often a stand-off: Developers are compelled to defend the alternatives offered based on their investment to date, and communities are left with few options but to accept or reject projects wholesale. Breaking this vicious cycle will take new systems for engagement beyond traditional town hall presentations or reactive public comment periods, especially post-COVID-19.

- ***A new pathway to equitable infrastructure investment and action*:** In parallel to changing conversations about infrastructure, there are also several opportunities for

federal, state, and local leaders to generate more equitable infrastructure outcomes. Recognizing the high and distributed costs of failing to act—especially for and in chronically underserved communities—is an important starting point for reframing how we tackle existing assets and invest in new solutions.

We need to create new incentives—not just new projects—that encourage greater regional experimentation and shared learning. For example, removing outdated highways and enhancing underutilized assets like parks and green space shouldn't be ad hoc efforts in only a few regions; these efforts should feed into a larger national infrastructure strategy in which state and local leaders have the financial and technical capacity to drive more accessible, resilient designs. Additional federal funding and programmatic guidance around equitable infrastructure upgrades can raise visibility of the issue and, most importantly, prompt action.

The second brief in this series builds off these ideas and lays out four strategies that can help undo the harms of our legacy infrastructure systems. Better defining and measuring our legacy infrastructure needs is a start, but federal, state, and local leaders have a long way to go to address these needs. Even though COVID-19 has exacerbated many of these challenges—limiting our fiscal ability to plan and launch even ordinary infrastructure investments—we have an opportunity to plot out a new recovery agenda. Our current and long-standing infrastructure inequities demand it.

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Report

Four steps to undo the harms of legacy infrastructure in the COVID-19 recovery

Shalini Vajjhala and Joseph W. Kane Thursday, December 17, 2020

Editor's Note:

This brief is the second of a two-part research series. Click here to read the first research brief.

Across the U.S., millions of people lack reliable and affordable water, transportation, energy, and broadband access. Now, the COVID-19 pandemic has brought these underlying infrastructure failures into sharp relief; for Americans who can't afford their bills, electricity and water shutoffs have become an immediate public health hazard.

In some cases, these critical infrastructure gaps are the result of decades of underinvestment and poor maintenance. In others, they represent a much more direct legacy of harm and deliberate racial and economic exclusion. As the first brief in this series on legacy infrastructure highlights, many of our existing infrastructure systems—originally designed to foster growth—are now limiting economic opportunity, damaging the environment, and hurting our health. This is especially true for lower-income households and communities of color.

However, within our current pandemic-induced economic crisis is an opportunity to address these structural inequities. In this brief, we propose a four-part national infrastructure stimulus program that not only drives new projects, but also enables the removal of old assets that no longer serve their intended purpose.

Take, for example, cities with declining populations. Water and sewer utilities are faced with the impossible balancing act of keeping an oversized system safely in operation with a declining user and tax base from which to fund repairs and upgrades. Often, the only

option is to raise rates. This shifts the burden to residents, who themselves are dealing with the direct impacts of economic decline due to population loss, deteriorating public services, and unaffordable rate increases.

Funding the strategic removal or decommissioning of harmful, divisive, aging, and failing infrastructure can enable communities to invest more productively in services they need and want most. No one *needs* a highway or water main—they need affordable options to travel to work or school and get clean water.

Dealing with our legacy infrastructure assets will require a sequential approach. First, Congress should include dedicated funding for local and state governments in a short-term relief package to support expanded public engagement, strategic planning and analysis, and community-led infrastructure experiments and temporary installations. This funding can both fill major state and local capital planning budget gaps and help communities—the end users of infrastructure—drive the discussion around what should stay and what should go in a post-COVID-19 future. The second phase should provide larger-scale project capital as part of a medium- to long-term federal investment agenda to enable the removal of legacy assets and clear the way for community-led, equitable, and climate-smart redevelopment.

Below are the four key funding areas that can form the building blocks of the proposed approach. The first three are targeted toward short-term relief allocations to state and local governments, while the fourth is intended to be a dedicated source of federal project capital or a new program, like the Department of Housing and Urban Development's (HUD) National Disaster Resilience Competition. All four activities, in sequence, can help policymakers and planners move away from the knee-jerk instinct to seek shovel-ready projects and instead jump-start a sustainable recovery.

- **Conduct strategic analyses on the costs of inaction on legacy systems**: Underinvesting in infrastructure has consequences. Rather than looking only at future infrastructure needs, federal and state agencies can create significant investment opportunities by also identifying major risks and liabilities to their own budgets and operations. Specifically, this approach looks to minimize losses; for example, who loses money if we leave a deteriorating bridge, tunnel, dam, or water

system in place? The answer is rarely only the local or adjacent community. Delayed maintenance can lead to cascading failures that ultimately cost more than removing or replacing an asset. Recognizing the high and distributed costs of failure—especially for chronically underserved communities—is an important starting point for reframing how we handle legacy infrastructure assets, better maintain a state of good repair, and invest in new projects.

Recommendation: Fund a national study to identify the top 10 infrastructure liabilities for each major federal agency and critical cross-agency gaps. Examples of potential liabilities (and federal cost-saving opportunities) include large-scale projects (e.g., the Oroville Dam prior to its repair), categories of assets (e.g., deteriorating bridges or access roads to military installations), and populations facing major infrastructure-related environmental health risks (e.g., households affected by lead pipes, urban air pollution, or lack of safe wastewater infrastructure). Provide funding for similar state-level assessments of at-risk infrastructure with significant state and local budget implications, in order to set priorities for future federal funding applications to address the most significant legacy infrastructure problems in each state.

- **Fund greater virtual public engagement**: The COVID-19 pandemic has disrupted the standard public engagement processes on infrastructure, but there is a real opportunity to transform how local governments gather feedback on infrastructure priorities and from whom. The channels for digital outreach and input developed in response to the pandemic can play a key role in drawing in residents who do not typically have the time, resources, or caretaking support to participate in multihour public meetings or design charrettes. Providing actionable information to planners before larger construction funds are available can help both public and private project developers design for what people need now—not only what was important in a past decade or what is deemed "fundable." Participatory budgeting models can initiate community engagement processes that have real financial "teeth" and make a meaningful link between community input and infrastructure investment. Consider the difference between asking residents how they would divide and spend $100

million dollars on critical services versus soliciting reactions to a pre-cooked $100 million project proposal.

Recommendation: Create a funding set-aside with competitive and formula-based federal funding allocations for participatory infrastructure planning workshops with dedicated resources to compensate low-income and minority residents for their participation. Reward effective engagement by adding scoring criteria to larger follow-on infrastructure funding opportunities, similar to how the Federal Emergency Management Agency's new Building Resilient Infrastructure and Communities (BRIC) program criteria include extra points for applications generated from previous "advance assistance" awards.

- **Support interim uses and enable infrastructure experiments**: Major infrastructure projects can take years to plan and build, but community needs are often far more urgent. Federal and state funding programs can do a better job of creating a runway of investment in megaprojects by offering resources for interim installations to make spaces usable and meet service needs while those megaprojects take shape. Several cities have experimented with "pop-up" projects that offer residents a chance to experience and provide input on longer-term development decisions. Hoboken, N.J.'s Northwest Resiliency Park is an excellent example of how temporary infrastructure installations can be part of a successful public engagement process. This approach can have the added benefit of creating spaces to test, demonstrate, and expand investment in green, distributed infrastructure solutions that reduce locking communities into long-term infrastructure.

  Recommendation: Create a new pilot program within short-term relief and recovery funding packages for community-supported infrastructure experiments to support major transportation, water, energy, and telecom system upgrades. Examples include bus rapid transit corridors, bike lanes and pedestrian plazas, flood control installations, and distributed energy and telecom systems. Funded pilots can complement these expanded public engagement projects and be rewarded in follow-on funding application scoring criteria.

- **Reward the removal of legacy harms**: Federal tax and investment incentive programs should consider how to incorporate provisions for removing failing infrastructure as part of enabling new investment. Federal brownfields funding programs have done this for decades with contaminated lands. The city of Detroit's blight removal bond is another example that demonstrates how getting rid of failing assets can increase property values and reduce fire hazards. We need a similar approach for infrastructure. Successful infrastructure removal projects that have created space for major redevelopment include San Francisco's Embarcadero Freeway, Portland, Ore.'s Harbor Drive Freeway, and Milwaukee's Park East Freeway. A key caveat is that any incentives for clearing the way for new infrastructure and development should always be carefully balanced with provisions to preserve affordability and protect current residents. New Orleans' Claiborne Corridor and Oakland, Calif.'s I-980 offer lessons on the importance of putting residents first rather than focusing on a piece of infrastructure.

  Recommendation: Similar to the HUD National Disaster Resilience Competition, create new competitive agency-specific federal funding programs to encourage the development of projects that reduce sector-specific liabilities identified in the national and state studies proposed above. Funding applications should require cost-benefit analyses that clearly demonstrate how and how much projects will reduce federal and state liabilities and/or risks. The resulting cost savings can be captured for program cost-recovery or directed to a revolving fund to support additional projects.

As we look to the long-term recovery from COVID-19, federal infrastructure efforts should not only account for what we need, but also for what we no longer need. Stimulus funding needs to be quick and responsive to be effective; however, hasty infrastructure investment is unlikely to serve anyone well in the long term.

The Biden-Harris Transition Team has already identified climate change and racial equity as two of its top priorities. Unless COVID-19 economic stimulus and recovery funding efforts enable the types of activities outlined above, the new administration runs the risk of missing the chance to address those priorities, and instead entrenching new kinds of generationally unequal investments.

In a few short months, COVID-19 has reshaped how we use many types of public infrastructure. It would be a failure of imagination if we didn't use this opportunity to reimagine our legacy infrastructure systems and fund a more equitable, climate-smart future.

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Insurance Innovation and Community-Based Adaptation Finance

Shalini Vajjhala and James Rhodes

Governments traditionally act as "insurers of last resort." When disaster strikes, vulnerable communities turn to local, state, and federal government agencies for support and recovery assistance. More recently, as the frequency and severity of various disasters–from severe storms and floods to wildfires–have grown,[1] the gap between who has financial protection in the form of insurance and who does not has also grown. For example, in California, only 13 percent of homeowners carry earthquake insurance,[2] and after recent wildfires, other homeowners' properties could become entirely uninsurable in the future.[3]

This "protection gap" is particularly challenging to address in low-income and marginalized communities, where risk awareness and insurance affordability can be major barriers.[4] As a result, many government agencies have found themselves being expected to act as insurers of *first* resort. This is an unsustainable situation for both budget-constrained public entities and vulnerable communities and residents who face years of delays in getting assistance to get back on their feet after a disaster.

This article highlights how insurance can be a catalyst for implementing both engineering and social-ecological adaptation measures.[5] The following sections describe why insurance innovation is unlikely to occur on its own and offer three ideas for how local governments can work with the insurance industry to craft integrated resilience solutions that promote community-scale adaptation, measurably reduce risk, and improve long-term physical and financial protection for at-risk communities.

Insurance as a Catalyst for Climate Adaptation: Barriers

Insurers have long championed investments in physical risk reduction. Examples include seat belts to reduce the human and economic costs of automotive accidents, fire codes for

1 Walsh, J. et al. "Ch. 2: Our Changing Climate," *Climate Change Impacts in the United States: The Third National Climate Assessment* (Melillo, J.M., Terese, R. [T.C.], and Yohe, G.W. [eds.]), U.S. Global Change Research Program (2014), pp. 19-67. doi: 10.7930/J0KW5CXT

2 Fuller, T. "In Quake-Prone California, Alarm at Scant Insurance Coverage," *The New York Times* (August 31, 2018).

3 Walsh, M.W. "How Wildfires Are Making Some California Homes Uninsurable," *The New York Times* (November 20, 2018).

4 Calvesbert, G. "Why does the protection gap exist?" AIR Worldwide (2016), available at https://www.air-worldwide.com/Blog/Why-Does-the-Protection-Gap-Exist-/.

5 Davidson, J.L. et al. "Interrogating resilience: toward a typology to improve its operationalization," *Ecology and Society*, 21(2):27 (2016). doi: 10.5751/ES-08450-210227

urban buildings, and workplace safety standards, among other measures.[6] Common features of these cases are that clear and effective measures were available to reduce risk (and rising insurance industry losses), the measures were affordable for consumers and property owners, and advancing these measures aligned well with the established business models and financial interests of insurance industry firms.

The insurance industry has recognized that climate change poses similar industry-wide challenges. Many insurance companies have become active participants and leaders in global discussions and initiatives on building resilience, promoting adaptation, and reducing the protection gap in recent years.[7] However, advancing projects on the ground that deliver meaningful risk reductions has been elusive, for a number of reasons.

First, the terms adaptation and resilience encompass an enormous diversity of potential activities and risk-reducing measures, and there is no clear consensus on which solutions to implement. Projects range from hard engineering solutions–such as seawalls and flood barriers–to ecological interventions, like protecting and expanding wetlands and mangroves, to planning exercises and social capacity building.[8] The effectiveness of many of these measures for delivering quantifiable risk reductions has yet to be demonstrated for insurance purposes. For example, life-insurers have copious amounts of data available on the effect of smoking on life expectancy and can adjust premiums accordingly. The same is not yet true of green infrastructure measures designed to reduce flood risk. This challenge is made even more complex with climate change, since historical data is not a reliable predictor of future impacts. There are some emerging firms, such as MyStrongHome,[9] that are filling these types of data gaps and standardizing the process of capturing insurance savings to support resilience measures; however, the market is far from developed.

Second, many resilience projects have distributed beneficiaries and few existing mechanisms for coordinating the kinds of collective action required for effective implementation. Consider a coastal protection project that reduces surge and flood risk for hundreds of property owners in a protected area. Individual property owners generally don't have the capacity or authority to develop such large-scale projects on their own, and from an insurance perspective, property-level policies are generally provided by many different carriers. No single insurer has the incentive to invest time and resources in finding collective solutions when the benefits would also accrue to its competitors. Further, individual insurers often have a hard time setting premiums that reflect the full value of risk reduction measures due to a lack of visibility on projects, lack of standards for implementation, and lack of data on the resulting benefits (reductions in expected losses).

6 Ben-Shahar, O. and Logue, K.D. "Outsourcing Regulation: How Insurance Reduces Moral Hazard," *Michigan Law Review*, 111, 197 (2012), available at http://repository.law.umich.edu/mlr/vol111/iss2/2.

7 InsuResilience Global Partnership (2018), available at https://www.insuresilience.org/.

8 Davidson, J.L. et al. "Interrogating resilience" (2016); Meerow, S., Newell, J.P., and Stults, M. "Defining urban resilience: A review," *Landscape and Urban Planning*, 147 (2016), pp. 38–49.

9 MyStrongHome (2018), available at https://www.mystronghome.net/.

Cases where the insurance industry has effectively championed risk reductions for distributed beneficiaries have focused on sector-wide codes and standards rather than local projects or protection measures.[10] Risk modelers can help bridge the gap between insurers and project developers to quantify the (financial) benefits of resilience projects using industry-trusted models, but data alone is not enough to enable the coordinated investments required to deliver projected benefits. New business models are required to coordinate beneficiaries and consolidate benefits if they are going to help advance project implementation.[11]

Third, there is a mismatch in timing where adaptation is long-term and insurance is short-term. Most insurance contracts are renewed annually, while most risk reduction projects have far longer lifetimes and payback periods. This makes it difficult for insurers to amortize upfront costs even when risk reduction measures can help them meet their own longer-term financial objectives, such as reducing potential losses or diversifying their portfolio. This is an area ripe for new product development in the insurance industry. In 2015 the Canadian insurance firm, The Co-operators, created a new retail insurance policy called "Comprehensive Water" to provide coverage for climate change-related storm surge and riverine flooding, as well as more standard types of water damage.[12]

Fourth, the market structure of the insurance industry poses particular challenges for innovation. Complex regulatory obligations and large capital requirements make it difficult for innovative start-ups to enter the market, and the insurance sector doesn't benefit from the intellectual property protections available in other industries. As a result, insurance companies have limited incentives to pioneer new financial mechanisms that can take significant time and resources to develop when competitors can easily copy the resulting products.

Fifth, and finally, insurers do not have incentives to reduce premiums. Stated another way, every private insurer's profit motive creates a natural disincentive for them to advance initiatives that reduce their top-line revenue. Fostering competition across the whole industry is the only way to overcome these last two disincentives.

The result of these barriers to insurance innovation is that local governments and at-risk communities face significant challenges in aligning physical protections, like resilient infrastructure, with financial protection, including private insurance. Investing in cost-effective adaptation and economic development projects is hard. In most of these projects success is something that does not happen–a storm hits, but the community isn't flooded. The lack of transparency in insurance pricing and the uncertainties created by annual changes in

10 Ben-Shahar, O. and Logue, K.D. "Outsourcing Regulation" (2012).

11 Kahn, M.E., Casey, B., and Jones, N. "How the Insurance Industry Can Push Us to Prepare for Climate Change," *Harvard Business Review* (August 28, 2017), available at https://hbr.org/2017/08/how-the-insurance-industry-can-push-us-to-prepare-for-climate-change.

12 Staff Report. "The Co-operators Offers Storm Surge Insurance to Homeowners in Atlantic Canada," *The Insurance Journal* (August 27, 2018), available at https://www.insurancejournal.com/news/international/2018/08/27/499165.htm.

pricing for policy renewals makes it challenging for any individual policyholder to negotiate to reduce premiums and capture insurance benefits. (Picture calling your health insurance company to negotiate a premium discount for going to the gym more often.) Despite the many obstacles above, insurance is one of the best ways to monetize benefits that are realized in the form of "avoided losses." So how can local governments work with the insurance industry to improve physical and financial protection for at-risk communities?

Opportunities for Insurance-linked Finance for Community-Based Adaptation

Resilience Bonds are a new mechanism to link catastrophe insurance with infrastructure projects–serving both engineered and socio-ecological resilience functionality–that are designed to measurably reduce expected losses.[13] The aim is to translate insurance savings into a revenue stream that helps communities tap new sources of project capital for adaptation and economic development and get major resilient infrastructure projects off the drawing board and into the ground. This insurance product works best when there is a large risk (high expected losses), existing insurance coverage (from which to capture savings), and a significant risk reduction solution–like seat belts. These are ideal conditions for monetizing and capturing insurance benefits. But most communities across the U.S. are not dealing with ideal conditions, so this article offers three complementary ways that communities can take a proactive approach to using insurance-linked finance for adaptation.

Financing Large-Scale Protection Projects

In January 2016, the U.S. Department of Housing and Urban Development (HUD) awarded nearly one billion dollars for resilience projects in 13 communities across the country as part of the National Disaster Resilience Competition.[14] Most of these communities' proposals included large-scale engineering solutions to protect areas that were previously devastated by disasters. Although a billion dollars is an enormous sum, many communities still need to fill significant project funding gaps. One example is the city of Minot, ND.

In 2011, the Souris River flooded at unprecedented levels, leading to evacuations of approximately 11,000 residents and causing hundreds of millions of dollars in infrastructure damage in Minot. Since then, the city has developed plans for a comprehensive $800 million flood protection project. Funding from HUD and other federal sources is expected to cover part of the total project cost, but the city and state are working with FEMA, the Army Corps of Engineers, and others to explore options for financing the remainder.

13 Vajjhala, S.P. and Rhodes, J.S. "Leveraging Catastrophe Bonds as a Mechanism for Resilient Infrastructure Project Finance," re:focus partners (2015), available at http://www.refocuspartners.com/wp-content/uploads/2017/02/RE.bound-Program-Report-December-2015.pdf; Kahn, M.E., Casey, B., and Jones, N. "How the Insurance Industry Can Push Us to Prepare for Climate Change" (August 28, 2017); and Vajjhala, S.P. and Rhodes, J.S. "A Guide for Public-Sector Resilience Bond Sponsorship," re:focus partners (2017), available at http://www.refocuspartners.com/wp-content/uploads/pdf/RE.bound-Program-Report-September-2017.pdf.

14 U.S. Department of Housing and Urban Development. "National Disaster Resilience Competition" (2018), available at https://www.hud.gov/program_offices/economic_development/resilience/competition.

Insurance-linked finance offers a pathway to help smaller communities like Minot that have spent years designing comprehensive protection projects to get those projects financed and built. The key steps include:

- Design a large-scale resilient infrastructure project to optimize reductions in expected losses and deliver insurance benefits. Project developers should engage risk modelers and analysts early in the design process to help set design criteria (minimum thresholds) based on the optimal level of financial protection.
- Establish contractual or administrative mechanisms to consolidate and transfer risk, such as:
    (i) Develop risk pooling agreements to bring together large asset holders with shared insurance coverage and loss mitigation priorities;
    (ii) Create a new special district to pool distributed property risks by requiring property owners to purchase specified insurance coverage or pay an assessment to cover the cost of a new protection project; and
    (iii) Establish a pooled reinsurance program that requires property insurers providing coverage in a designated area to purchase reinsurance linked to specific risk reduction projects.
- Engage private finance partners and structure the project finance based on the projected future insurance savings captured through the loss mitigation project. Just as private investors in a toll road use forecasted toll revenue as the basis for investing in the project, investors in a protection project would provide the upfront capital to implement a protection project based on the forecasted insurance savings.
- Build the project and capture the insurance benefits over time to cover finance payments.

Aggregating Distributed Property-Level Interventions

Unlike Minot, many small- and medium-sized communities do not have the option to design and build comprehensive engineering projects to protect a single at-risk area. In these communities, coordinated action by individual property owners that opt-in to programs to meet higher levels protection can deliver more scalable and replicable community-wide resilience benefits.

Communities that could benefit from this approach include California residential communities devastated by wildfire, cities like Houston with large-scale residential flood damages from events like Hurricane Harvey, and smaller West Coast cities facing serious earthquake risks. Examples of administrative approaches that can help motivate, align, and capture the benefits of distributed household and property-level resilience retrofits and improvements include:

- Develop a program modeled on Property Assessed Clean Energy (PACE) programs for residential and small commercial adaptation measures and resilience upgrades. Capital for property-level interventions could be provided from public or private sources and payments could be coupled to property insurance and property taxes similar to PACE.
- Establish a special district with finance and taxing authority to implement area-wide risk reduction in collaboration with a private loss mitigation partner (such as MyStrongHome). Payment shortfalls from insurance savings (e.g., due to failure of property owner to renew coverage with participating carrier) can be added to property taxes/assessment reflecting the "special benefit" for each participating property-owner.

Capturing Network Benefits of Resilience Upgrades

A third area where local governments and authorities can work with the insurance industry to enable community-scale adaptation is by focusing on network improvements, such as transit, transportation infrastructure, and water system upgrades. Weather-related events (such as heavy rainfall and heat waves) can both disrupt daily system operations and pose major long-term financial liabilities. For example, heat has been attributed as a cause in major train derailments and service disruptions from Washington, DC and Chicago to Los Angeles.[15] Because transit disruptions have the greatest impact on low- to moderate-income (LMI) riders with limited alternatives, engineering adaptation projects to improve system performance can have the greatest benefits for LMI communities.

Designing projects that can reduce climate- and weather-related revenue and cost impacts can also help create new sources of project funding for risk-reduction and resilience projects and facilitate reinvestment in a virtuous cycle of adaptations and system improvements. Some steps that transit and utility leaders can take include:

- Conduct a rapid assessment of recent budget documents to identify key downstream costs created by weather and climate risks, such as extreme temperature and rainfall. Examples include increased operations and maintenance costs, business disruption, asset depreciation, and reduced revenue. Benchmark the potential for savings and value capture.
- Identify relevant ongoing, planned, and underfunded projects and programs in current capital plans, strategic plans, and resilience strategies that have the potential to significant address the risks identified above.

15 Schwartz, H.G. et al. "Ch. 5: Transportation, Climate Change Impacts in the United States: The Third National Climate Assessment" (Melillo, J.M., Terese, R. [T.C.], and Yohe, G.W. [eds.]), U.S. Global Change Research Program (2014), pp. 130-149. doi: 10.7930/J06Q1V53

- Develop an insurance-linked project finance and risk transfer program to make payouts to the relevant authority when pre-designated events or system failures occur and capture value from ongoing and planned projects that measurably reduce risks (in a revolving fund) and fill funding shortfalls for other priority projects.

Conclusion

Often the most cost-effective solutions to reducing disaster risk are the ones available to communities prior to a disaster that protect against a loss occurring in the first place. Yet cities are struggling to fund even basic infrastructure projects, let alone more complex investments in resilient systems. Public cash reserves and budgets for insurance are increasingly constrained, and the capital cost of large-scale resilient infrastructure, such as coastal protection projects or flood barriers, is often too high to be absorbed by local governments or utilities. Too often the benefits are diverse, diffuse, long-term, and non-monetary, making the same types of infrastructure investments unattractive to private investors.

Local governments have both the means and the opportunity to redefine how communities invest in adaptation and engage with the insurance industry to reduce risk, make resilient economic development investments, accelerate recovery–if and when disaster strikes–and more effectively manage the volatility and uncertainty associated with our evolving exposure to both natural hazards and the broader financial risks of climate change. This article offers three new ways of approaching the problem to empower local governments and communities to tap into innovative insurance solutions for adaptation finance. None of the pathways in this article are simple or easy. But together they offer new solutions that can help local governments bring in experts, including risk modelers and project finance firms, to deliver adaptation projects that would otherwise remain on the drawing board.

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RESILIENCE BONDS: A BUSINESS-MODEL FOR RESILIENT INFRASTRUCTURE

By Shalini Vaijhala,
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Before starting re:focus partners, Shalini Vaijhala served as Special Representative in the Office of Administrator Lisa Jackson at the U.S. Environmental Protection Agency. In this position, she led the U.S.-Brazil Joint Initiative on Urban Sustainability (JIUS) announced in March 2011 by presidents Obama and Rousseff. Shalini received her Ph.D. in Engineering and Public Policy and B.Arch in Architecture from Carnegie Mellon University.

James (Jamie) Rhodes joined re:focus partners as a Senior Fellow in 2014 to co-lead the RE.bound Program and develop a new portfolio of insurance-linked finance projects. He is an entrepreneur who holds multiple patents and has founded and built several successful enterprises across diverse industry segments. Jamie earned a Ph.D. in Engineering and Public Policy from Carnegie Mellon University, and worked as a Post-Doctoral Researcher at Scripps Institution of Oceanography and then as a Staff Researcher at U.C. Davis.

KEYWORDS

- RESILIENCE BONDS
- CATASTROPHE BONDS
- BUSINESS MODEL

When natural disasters occur, governments are often considered as "insurers of last resort" and are expected to help with losses not covered by traditional insurance and to coordinate and fund reconstruction efforts. As the frequency and severity of natural disasters (storms, floods, wildfires) increase, this becomes financially unsustainable for budget-constrained governments. Catastrophe bonds are one mechanism designed to transfer these types of risks to the capital market. They work as an insurance policy in which the holder of the policy receives a pay-out when a disaster reaches a predetermined threshold. re:focus partners came up with the idea of Resilience Bonds to complement catastrophe bonds. Resilience Bonds create incentives for cities to invest in resilience so as to reduce the human and financial cost of catastrophes when they strike. Resilience Bonds are designed to fund risk reduction projects via a resilience rebate that turns avoided losses in to a revenue stream.

INTRODUCTION

As the frequency and intensity of extreme weather events increase due to climate change, local and national governments are increasingly expected to step up to cover the damages and pay for reconstruction. Often considered as "insurers of last resort" public authorities are more and more often being called upon as the first resort, and they need to find sustainable business models to fund resilience. Still, it remains difficult for a public authority to pay for something when the cost is high, the benefits are diffuse, and the probability of extreme losses is low. To find financial resources and transfer the risks of such catastrophic events to financial markets, cities and utilities are investigating new financial and insurance mechanisms such as Catastrophe Bonds and Resilience Bonds.

re:focus developed the mechanism of Resilience Bonds in 2015 with the ambition of building more integrated resilience solutions and innovative public-private partnerships for vulnerable communities. Based on the same financial modeling as Catastrophe Bonds, Resilience Bonds are designed to fund both proactive risk reduction projects and reactive disaster recovery actions.

1. THE MAIN ISSUE UNTIL NOW: FINANCING RESILIENCE IS NEITHER POLITICALLY NOR FINANCIALLY REWARDING

When a disaster strikes, communities generally expect governments to pay for the losses not covered by traditional insurance and to coordinate and fund reconstruction efforts. As the frequency and severity of natural disasters (storms, floods, wildfires) increase this becomes financially unbearable for budget-constrained governments. Even more so as the gap between insured losses and total losses is increasing. Between 2005 and 2015, the United Nations counted 335 climate related disasters every year, twice as many as between 1985 and 1994[1]. And the cost of each catastrophe grew six-fold from around $30 billion per year to $182 billon[2]. Moreover, in 2016, only 26% of economic losses due to natural disasters were insured[3].

In heavily urbanized areas of developed countries, additional challenges arise and increase the cost of each weather-related disaster. For example, older cities have to factor in aging infrastructure systems that are increasingly vulnerable and at risk of cascading failure. A storm can damage a power system and cut production for weeks, dramatically increasing the cost of an extreme event. In developing countries, municipalities are also struggling to keep up with informal urbanization and the extreme vulnerability of their inhabitants.

Planning ahead could dramatically reduce the cost of each extreme weather event. But cities are often budget constrained and faced with stretching limited funding to address many competing priorities. It is difficult to pay for something when up-front costs are high, benefits are diffuse and extend far into the future, and the probability of extreme losses is low. On top of that, success in well-designed resilient infrastructure is often invisible. In other words, success happens when nothing happens. While investing early in resilience saves lives and money, it is often neither politically nor financially rewarding. To create incentives for cities to invest in resilience, re:focus created Resilience Bonds to transform avoided losses into revenue flows, and to make invisible successes visible and economically capturable.

2. THE MODEL OF RESILIENCE BONDS: FUNDING BOTH PROACTIVE RISK REDUCTION AND REACTIVE RECOVERY ACTIONS

2.1. GENESIS OF CATASTROPHE BONDS: TRANSFERRING RISKS TO CAPITAL MARKETS

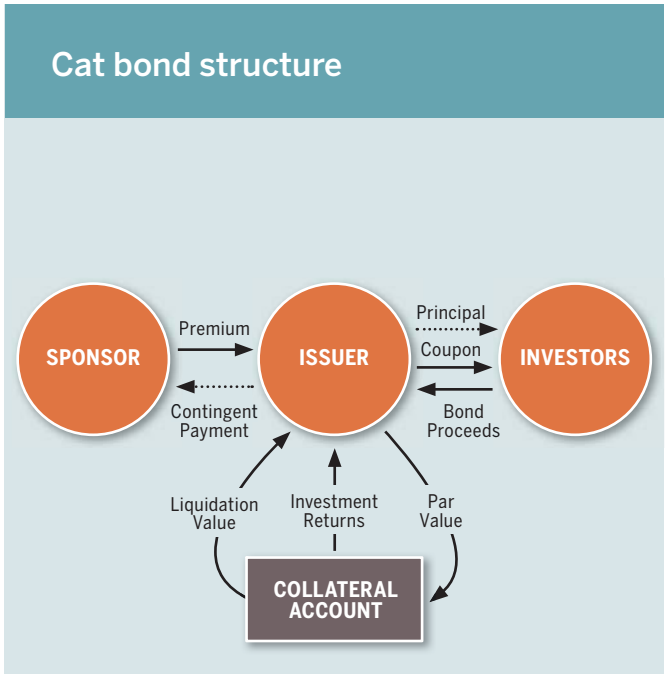
Catastrophe Bonds (also called Cat Bonds) emerged in the 1990s after Hurricane Andrew hit the State of Florida in the United States[4]. There was tremendous financial devastation because of the large real estate market and major tourism industry. The insurance industry came together to create an instrument to protect itself against extreme losses: Catastrophe Bonds. These instruments are insurance policies and *not* traditional municipal bonds that you use to build a road or a seawall. Each policy typically has a short term, between three and five years. What makes

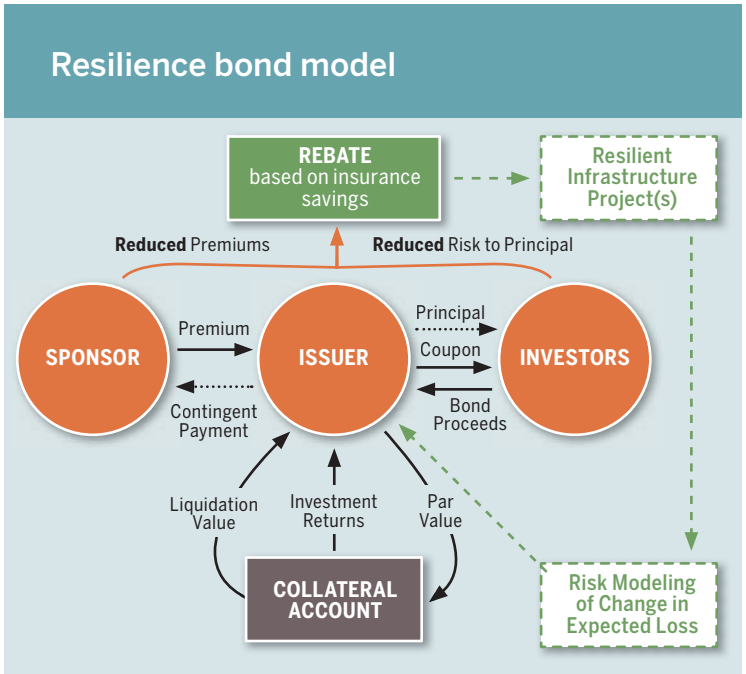
1 United Nations Office for Disaster Risk Reduction.

2 Swiss Re, *Closing the protection gap. Disaster smart solutions for the public sector*, 2016.

3 Aon, *Impact Forecasting. Annual global climate and catastrophe report*, 2017.

4 Michael Lewis, *In Nature's Casino*, The New York Times, 2007.





"CAT BONDS ARE SIMILAR TO LIFE INSURANCE POLICIES THAT ONLY PAY OUT WHEN THE WORST DISASTERS STRIKE. RESILIENCE BONDS ARE MORE LIKE PROGRESSIVE HEALTH INSURANCE THAT PROVIDE INCENTIVES TO MAKE HEALTHY CHOICES THAT REDUCE LONG-TERM RISKS."

them unique is that when a disaster reaches a predetermined threshold, the holder of the policy receives a pay-out, the same way a life insurance holder would, and investors lose part or all of their principal invested. The purpose of Catastrophe Bonds (and Resilience Bonds) is to transfer risk to capital market. Nowadays the market for Cat Bonds is around $30 billion and growing rapidly.

2.2. THE DIFFERENCE BETWEEN CAT BONDS AND RESILIENCE BONDS

Resilience Bonds are a form of Catastrophe Bond that link insurance premiums to resilience projects in order to monetize avoided losses through a rebate structure. The "resilience rebate" is a source of funding for measurable risk reduction projects. If Catastrophe Bonds are similar to life insurance policies that only pay out when the worst disasters strike, then Resilience Bonds are more like progressive health insurance programs that provide incentives to make healthy choices—quitting smoking or exercising regularly—that reduce long-term risks and the cost of care.

The difference between a Resilience Bond and a Catastrophe Bond is that it uses the same financial modeling as in a Catastrophe Bond, but it models two scenarios: business-as-usual and a world with a protective infrastructure project. It estimates the difference in the expected losses when the catastrophe happens with and without the project. That difference is captured as a resilience rebate and this rebate can be used to fund the project itself.

There are two main advantages of a Resilience Bond.

(1) The first is that it expands financial protections for communities vulnerable to a catastrophic event. When the predefined threshold is hit, the sponsor receives a rapid payout, which makes post-disaster reaction quicker.

(2) The second advantage is to leverage new project finance for resilient infrastructure that offers a measurable risk reduction. Resilience bonds are therefore designed to fund proactive risk reduction projects and reactive disaster recovery actions.

The major innovation is that it initiates infrastructure projects with resilience in mind. It helps cities design new solutions instead of building more of the same, because resilience is about systems, not just one-off projects.

2.3. AN ECOSYSTEM OF MULTIPLE SPONSORS

The process of designing and issuing a Resilience Bond generally involves an ecosystem of players ranging from local and state government officials who are responsible for disaster prevention, to insurers who will pay for the losses, utility operators who are at risk, and the engineering and construction companies that can reduce risk as part of their businesses.

In most cases, a city government is rarely the largest asset-holder affected by a catastrophe. If you take the case of Norfolk, Virginia, the city does not hold most of the assets at risk, even though it has the ability to build comprehensive coastal protections and the responsibility to do so in specific areas. This is the reason why Resilience Bonds were designed to engage multiple sponsors[5], the same way you would have a cooperative or homeowners association in a building in order to have all the affected players in the scheme.

re:focus collaborates with many engineering and construction companies, which reduce risk as part of their business to offer a wide range of technical solutions to a given problem encountered in one place. In some cases, operating engineering firms are able to see more sides of a client's exposure to risk than a client itself, and these firms have the best vantage point to design comprehensive and cost-effective system solutions rather than one-off projects that are limited by a single agency or department's authority or budget.

2.4. A FINANCIAL TOOL FOR RESILIENCE PROJECTS

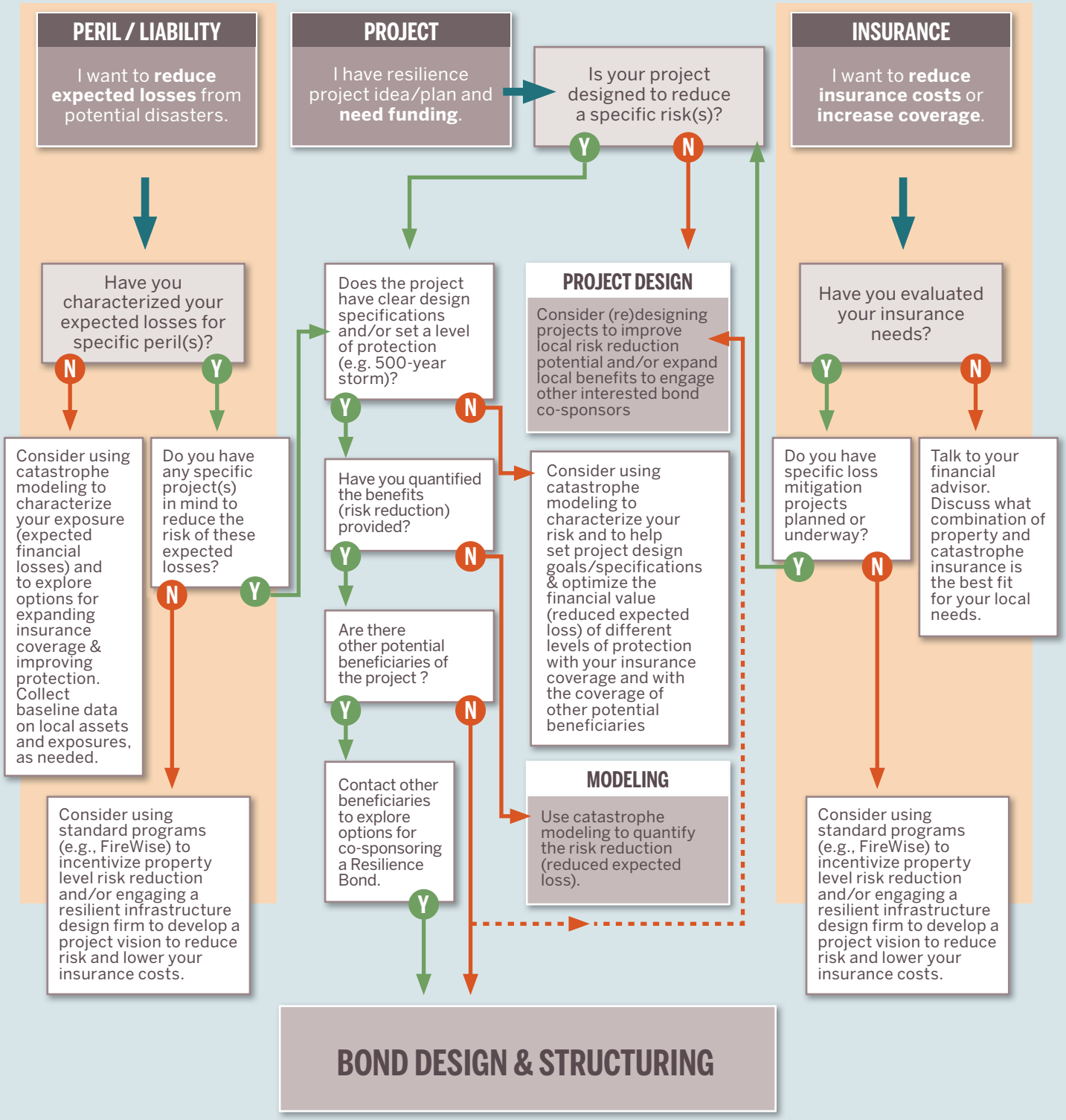
re:focus serves as an agent for loss mitigation, aligning risk reduction projects with insurance benefits on behalf of both public and private entities.

To serve the best interest of all of these entities, it is important to make very clear where Resilience Bonds can be appropriate and where they are not the right tool. Not all projects are a good fit for a Resilience Bond approach. Some projects are too difficult to model, and some are too small to create quantifiable or meaningful risk reductions. Some projects are too diffuse, such as capacity building programs or emergency preparedness plans, and some projects have high operational uncertainty which makes benefits hard to estimate. It is worth noting that Resilience Bonds are designed for catastrophic events not chronic stress like water scarcity. re:focus works with clients and partners on alternative insurance-linked project finance solutions for these other types of hazards as well.

Timing is also very important. Public entities often need technical assistance to go from where they are now to where they need to be to start a Resilience Bond project (cf. figure below). For example, if a city has a concept for coastal protection but does not know what level of protection it needs, it means that there is still preliminary design work that needs to be completed before exploring if and to what extent a Resilience Bond can help finance the project.

5 The sponsor is the one who pays the premium and receives the payout in the event of a disaster.

Bond design & structuring



Source: www.refocuspartners.com/rebound

3. ACHIEVEMENTS AND REMAINING CHALLENGES FOR RESILIENCE BONDS

3.1. ACHIEVEMENTS AND MAIN PROSPECTS FOR THE UPCOMING YEARS

re:focus released a framework for Resilience Bonds in December 2015. The mechanism has since been validated by multiple partners in the insurance industry and capital markets over the course of 2016 and 2017 to set the stage for the first wave of transactions. Since then, re:focus has been working with both private partners and public sector entities toward the first Resilience Bond issuance. The process of developing public-interest Resilience Bonds is slower than issuing a conventional Catastrophe Bond because it is necessary to align the timing of a Resilience Bond issuance with the timing of major infrastructure projects. A Resilience Bond is designed to be issued when a resilience project comes into effect. In the case of a seawall, it can be up to a decade from design going through construction. Public sector Resilience Bond projects will mainly be driven by project design timelines not insurance industry timelines.

So far, the priority has been large public infrastructure projects in North America, largely because this is where the Catastrophe Bond market has sparked the greatest interest. For example, the New York Subway System and Amtrak both issued their own Catastrophe Bonds after Hurricane Sandy in 2013. There is also a straightforward path between high value assets and major resilience projects in cities like San Francisco, Houston, and Miami.

Another line of work is being investigated in collaboration with major insurance players as part of the Center for Global Disaster Protection. This work focuses on extending the Resilience Bond model to developing countries. In these countries, when a disaster strikes damages are often more devastating to people and homes than large assets or commercial industries. As part of a collaboration with Risk Management Solutions (RMS) and Vivid Economics, DfID, and Lloyds of London through a new Innovation Lab[6], re:focus has been developing variations of Resilience Bonds that can better leverage humanitarian aid and international development funding for disaster risk reduction projects around the world.

Overall, both private and public actors are enthusiastic about the possibilities offered by Resilience Bonds. But public-sector projects are much harder to develop. Unlike private actors that can mitigate losses for their own covered assets, public sector projects are often far broader. Private actors have specific expectations; the asset owner is the one at risk, and the one able to implement the project and enjoy the benefits of the investments. Therefore, it is a much more contained conversation and resilience projects are easier to move forward. In the public sector, the conversation requires many more stakeholders, they move at a slower pace and the stakeholder with the authority to implement a large infrastructure project is not always the greatest beneficiary even though they are responsible for the process.

6 RMS, *Enter the Center*, 2018.

"NOT ALL PROJECTS ARE A GOOD FIT FOR A RESILIENCE BOND. SOME PROJECTS ARE TOO DIFFICULT TO MODEL, OTHERS ARE TOO SMALL OR DIFFUSE TO CREATE QUANTIFIABLE RISK REDUCTIONS."

3.2. REMAINING CHALLENGES AND THE NEXT FRONTIER

Designing major resilient infrastructure projects and systems is time-consuming and complex work. Making sure the design process generates meaningful and measurable risk reductions adds another layer of complexity. However, this is essential for avoided losses to be monetized. That can mean considering different technologies, construction methods, or other design solutions to increase the level of protection and create greater financial value. This is counterintuitive for most designers and engineers who are typically presented with a scope of work and/or budget at the outset of a project. They then work to design the best solution at the lowest cost.

The first challenge is engaging and collaborating with design and engineering firms that are willing to shift from this very narrow path to a more flexible and innovative approach. This allows both designers and clients to zoom out and identify where projects can be scaled up to capture greater financial value rather than downsized to match currently available funds. Most infrastructure projects are generally imagined based on what an agency can buy and not necessarily based on the desirable level of protection. Or ideas are too abstract. Enormous resilience solutions are envisioned, but without any practical path to implementation. A middle ground of a project pipeline of large scale and pragmatic risk reduction projects is essential for creating meaningful change.

The second element is to find the right point of intervention in a project design so that the financing can inform the design and the design can integrate the financing solution. Both in the private and public sectors, people who manage risk and insurance and understand how resilience projects could be translated into financial rebates are not the same as the staff who do capital planning for infrastructure or project implementation. This lack of communication or a common language or approach means that project opportunities to reduce risk are sometimes missed altogether. Risk managers need to understand how projects in their city or utility's capital and strategic plans can reduce overall system risk and project-level people need to understand the potential insurance benefits (and funding sources) created by their project. To put it differently, if your life insurance company does not know that you quit smoking, you will not see a change in your rates. Sometimes it is difficult to reach that alignment. Framing the discussion to engage departments with complementary priorities can also help build broader support with communities and local stakeholders so that they also understand the benefits from such projects.

Finally, our next frontier is to meaningfully model risk reduction and price the value of these reductions for a wider variety of infrastructure project types and perils. Resilience Bonds work very well for some projects and not for others. For example, modeling the risk reduction from a coastal protection project is very straightforward, but doing the same for a city-wide green stormwater infrastructure system is not. The real value of our work will be in extending models to more diffuse resilience projects and capturing benefits that are harder to model and spread across more beneficiaries over time. This is the case of housing reconstruction in Nepal after recent earthquakes or in the Caribbean following Hurricanes Irma and Maria. There are dramatic socio-economic consequences of disasters and great interest in resilient reconstruction, but a lot of challenges remain in aligning cost and benefits between international development project funding agencies and the insurance industry.

CONCLUSION

Resilience Bonds have been designed with the conviction that planning ahead of catastrophes is more cost-effective than post-disaster reconstruction. Resilience Bonds are designed to monetize avoided losses to help governments invest in proactive risk reduction infrastructure projects. The potential for local governments to fund resilience projects, to share the burden with other stakeholders and to transfer the risk of a catastrophe to capital markets using this mechanism are significant. While today Resilience Bonds only work for some projects where risk reductions are readily measurable and targeted, the ultimate objective is to extend the types of projects for which Resilience Bonds can work and serve a broader range of vulnerable communities around the world.

BROOKINGS

The Avenue

Investing in better procurement processes can enable better infrastructure outcomes

Shalini Vajjhala and Ellory Monks Monday, November 26, 2018

Editor's Note:

This post is the first in a two part series about how procuring infrastructure systems, technologies, and services can be an entry point to resilience in cities, rather than an obstacle to it.

Many cities across the United States are home to legacy infrastructure systems. These older water, transportation, and communications systems are not only poorly suited to current needs, but they are also nearing (or well past) the end of their usable lives after decades of underinvestment and deferred maintenance.

The motivation for investing in resilience—taking measures to adapt and modernize systems amid rising environmental and social pressures—could not be greater, especially at a local level.

However, local government resources for infrastructure transformation are limited at best. As a result, local leaders are caught in a tug-of-war. On one side are high-priority incremental repairs to keep critical services up-and-running. On the other side is all the up-front planning required to invest in long-term capital projects. Both are costly. Both are necessary. In the coming years, more places will inevitably be confronted with a stark choice: keep making short-term fixes or find the resources to make major upgrades and replacements.

As grim as this decision can be from a budget perspective, it is also an opportunity. Cities across the U.S. have a once-in-a-generation chance to shift toward cleaner, greener technologies and build more resilient communities.

To seize this opportunity, cities must be able to buy things differently in order to buy different things. And that's where procurement processes can be a hurdle to achieving greater resilience.

The term *procurement* encompasses all the steps that governments or public authorities take to obtain goods, such as computers or desks, or services like healthcare or construction of a water treatment plant. Most existing procurement processes make it easiest for government agencies to buy what they already have, provided by companies they've already worked with before. This bias toward the familiar can keep decisionmakers trapped in a "pieces-and-parts" replacement approach. This is true, even when more cost-effective upgrades, replacements, or wholesale transformations are readily available.

Picture the difference between replacing failing water mains and transitioning to city-wide green infrastructure solutions. The process for buying pipes and repair services is a well-trodden path, but figuring out how to buy and maintain thousands of street trees or miles of porous pavement is often uncharted territory.

The unfortunate consequence of this type of procurement "lock-in" is two-fold. Every day, cities miss opportunities to leapfrog to smarter, more sustainable, and more resilient infrastructure. And innovative companies and urban solutions simultaneously struggle to scale. This is a solvable problem, but pouring money into developing new technologies or better plans doesn't necessarily lead to project implementation or better outcomes.

Investing in better procurement processes up front can enable better outcomes, but knowing when and how to shift from the incremental to the transformational is an enormous challenge for cities of every size. Bigger cities often have more resources and expertise to dedicate to long-term planning for these transitions. But even smaller cities with fewer resources need the tools to design, procure, and build entirely new types of infrastructure solutions to make progress on big picture goals, including improving water and resource-efficiency, building resilience to climate change, and advancing social equity.

In recent years, several cities and counties have begun to experiment with how procurement can enable better outcomes.

One of the most compelling examples in the water sector is the Prince George's County Clean Water Partnership in Maryland. Rather than relying on a traditional procurement approach to address its stormwater challenges, the County pursued a 30-year public-private partnership. As part of a performance-based contract—with the aim to deliver more extensive green infrastructure—the County worked with Corvias, an engineering firm, to improve stormwater management and build a more equitable and diverse local workforce for project implementation. In other words, the County did not simply request proposals from potential vendors to get the project done, but it instead looked to break free from this traditional process and engage more directly with Corvias to aim for improved performance overall. And so far, nearly three years later, the County has met or exceeded all of its economic, social, and environmental objectives on time and under budget.

The Clean Water Partnership is a shining example of how procurement innovation can allow local governments to tap into new ideas, new partners, and new resources. But clearly, not all places have been able to pursue the same types of innovations—or realize more resilient outcomes. Investing in better procurement processes up front can enable better outcomes for taxpayers, residents, and businesses alike in cities across the United States. Moving forward, local leaders need to stop thinking about procurement as the end point of a process, and start looking at procurement as an entry point to spark new ideas, attract new partners, and generate new resources.