

## Innovative Funding for Flood Mitigation Infrastructure

The availability of federal recovery funds necessary to rebuild infrastructure and communities in the wake of Hurricane Harvey is limited due to the active hurricane and western fire season in 2017. Strategies to increase regional resilience differ from recovery needs; and the development and implementation of resilience policies and programs will require additional financial resources. Traditional federal funds have strict limitations as to what they may be used for and therefore are not always adequate for the needs of a community. To overcome this lack of funding from traditional federal, state, and local sources, communities should begin to look toward newer, more innovative approaches to funding. Three funding approaches that are receiving greater attention by communities around the United States include green bonds, environmental impact bonds, and resilience bonds.

State and local governments issue bonds as a way to borrow money to pay for large infrastructure and long-term capital projects such as roads, schools, and water treatment facilities. Investors buy bonds or sell them on secondary financial markets as a means to earn tax-exempt income. Future users of the infrastructure project typically service the government debt through taxes or tolls.

## Green Bonds

Green bonds are similar to other infrastructure-related bonds with one difference—they must demonstrate some type of environmental benefit, i.e. a qualified green investment as defined by the Climate Bonds Standard Board. The structure, risk, and return associated with green bonds are identical to those of traditional bonds.

Proceeds can be used for climate adaptation activity, which includes information support systems and early-warning systems; watershed conservation projects; and flood mitigation such as sustainable urban drainage systems. To date, most of these bonds have been focused on renewable energy, low-carbon buildings and transportation. However, the Climate Bonds Standard Board has approved certification criteria for water infrastructure projects. Certification criteria are under review for a variety of green infrastructure projects, such as coastal conservation infrastructure. A relevant example for regional post-Harvey efforts is the green water bond issued by the San Francisco Public Utility Commission to develop storm water management infrastructure.

## Environmental Impact Bonds

An Environmental Impact Bond (EIB) is another option for green infrastructure, storm water management and other forms of resilient infrastructure. An EIB is a tax-exempt municipal bond that utilizes a pay-for-success approach to financing infrastructure. The bond provides upfront capital for innovative resilience projects and shifts downside risk from government agencies to private sector investors. The public sector repays investors based on whether the agreed-upon environmental outcomes are achieved, as evaluated by a third party. If the agreed upon performance is not achieved, the investor covers the loss. However, if the project performs better than anticipated, returns for investors are higher.

The first EIB was closed in September 2016 with the DC Water and Sewer Authority. This is a 30-year, \$25 million bond with a mandatory tender after five years. In Louisiana, a state with a \$50-billion need for implementation of its Coastal Master Plan, the Environmental Defense Fund is working with the Louisiana Coastal Protection and Restoration Authority and other partners to design the first ever EIB for wetland restoration.

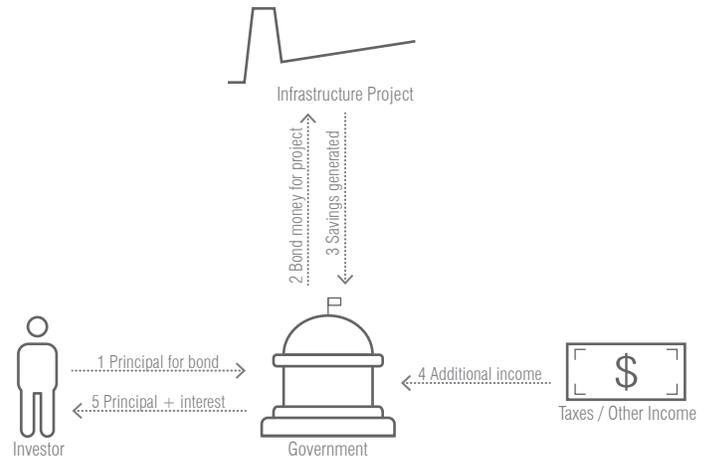


Figure 1 Bonds are a loan, paid back with tax-exempt interest at a predetermined date

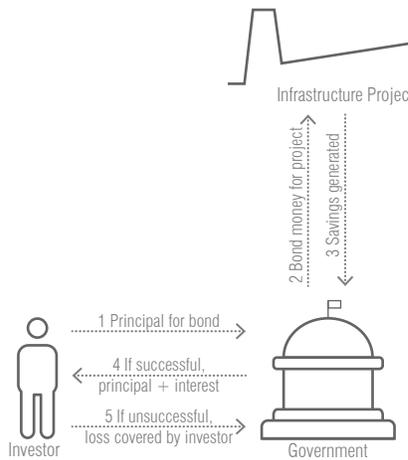


Figure 2 EIBs are paid back proportionately to the success of the project

### KEY TERMS

#### Bond

A loan from the investor (eg. individual) to the issuer (eg. government or company) to be paid back with interest over a pre-determined time period.

#### Principal

Initial amount of loan given by an investor to an issuer. Used to purchase a bond that will be paid back with interest.

#### Interest

A percentage of a borrowed amount charged by a lender as a fee.

#### Maturity

The final date of payment on a loan.

## Resilience Bonds

The modern finance industry has invented complex systems to transfer risk and give investors a chance to make higher than average returns. These methods can be used to reduce risk for public agencies and to help finance flood mitigation projects. Resilience bonds are bonds that fund infrastructure that will reduce the likelihood of losses during a natural disaster. These bonds can be used for coastal protection such as sea walls and stormwater-mitigating green infrastructure. Refer to Figures 3 and 4.

Resilience bonds build on catastrophe bonds, known as cat bonds. Cat bonds pair an investor with an insurance policy holder. Investors pay the issuer (eg. banks) a principal for a bond and earn interest on this bond until it reaches maturity (usually 3 to 5 years). However, in the event of a catastrophe during this time period, investors may lose some or all of their principal. The money that would have paid back the investor is used to pay the sponsor instead. Due to the higher risk of cat bonds compared to conventional bonds, investors earn higher than average interest rates. The sponsor (eg. a public agency or government) is the party that pays a premium to the issuer, similar to paying a premium for a car insurance policy. If no catastrophe occurs, the sponsor continues to pay this premium and the money is used to pay back cat bond investors. However, if a natural disaster does occur, similar to a car accident, the issuer will pay the sponsor to cover recovery costs using the principal and interest they do not pay the investors. Effectively, the investor in this equation buys a higher risk bond for a higher interest rate (paid for by the sponsor's premium payments), and the sponsor pays a premium to add to their insurance portfolio (paid for by the savings on the investor's principal in the event of a natural disaster).

A resilience bond issuer utilizes a catastrophe model to determine baseline risk, or cost, of natural disasters. This modeling establishes the size of the catastrophe bond issued for the project. The issuer then calculates how the implementation of a project that increases resilience to natural disasters would reduce future loss in comparison to the baseline. A resilience rebate is set based on the value of the anticipated loss reduction. The reduced risk of principal to the investor and the reduced premium expense to the sponsor is captured and provided to the sponsor as a rebate. This rebate can be used for financing resilient infrastructure or risk reduction investment.

The insurance linked securities (ILS) sector, which is primarily made up of catastrophe bonds, is a \$25.5 billion market. To date, no resilience bonds have been issued but there is increasing interest and effort to better quantify risk and uncertainty with regards to resilient projects that might be backed by these types of bonds.

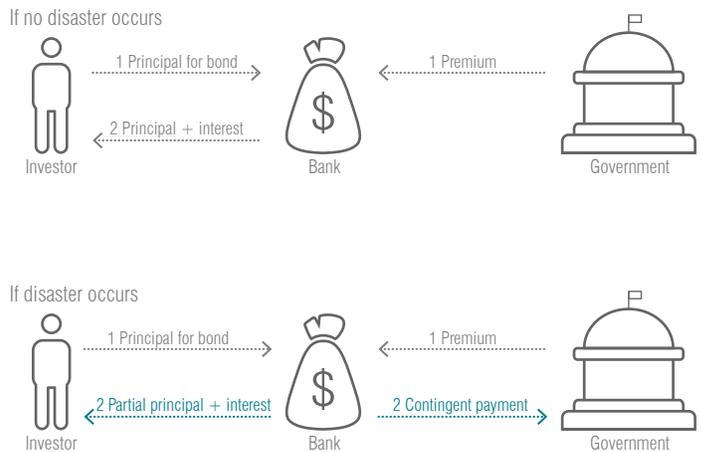


Figure 3 Catastrophe Bond

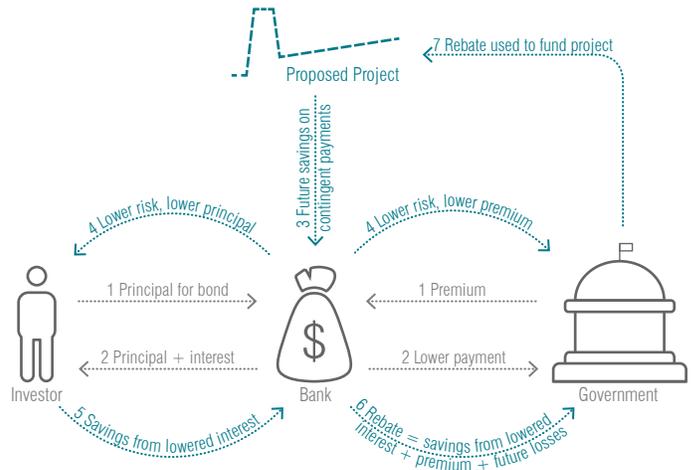


Figure 4 Resilience Bond

### KEY POLICY QUESTIONS

What regulatory and policy changes must be made to facilitate the introduction of innovative funding mechanisms to invest in resilient infrastructure for our region?

How do we utilize innovative funding mechanisms, such as environmental impact bonds, to leverage federal and state recovery dollars?

### For More Information Visit

Climate Bonds

[climatebonds.net/standards](https://climatebonds.net/standards)

Environmental Impact Bonds

[eesi.org/articles/view/environmental-impact-bonds-could-they-help-save-america-aging-infrastructure](https://eesi.org/articles/view/environmental-impact-bonds-could-they-help-save-america-aging-infrastructure)

Green Bonds

[icmagroup.org/assets/documents/Regulatory/Green-Bonds/](https://icmagroup.org/assets/documents/Regulatory/Green-Bonds/)

Greater Houston Flood Mitigation Consortium

[HoustonConsortium.com](https://HoustonConsortium.com)