

Managing Flood Risk: Opportunities at the Intersection of Science, Finance & Law

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Indiana Association for Floodplain and Stormwater Management

September 7, 2018



Resilience Finance: Changing Context

- Risk are increasing
- Data and Risk Analytics
- Metrics & Methodologies
- Capital Availability & Investor Appetite



Moody's Warns Cities to Address Climate Risks or Face Downgrades

By **Christopher Flavelle**
November 29, 2017, 4:00 AM EST
From **Climate Changed**

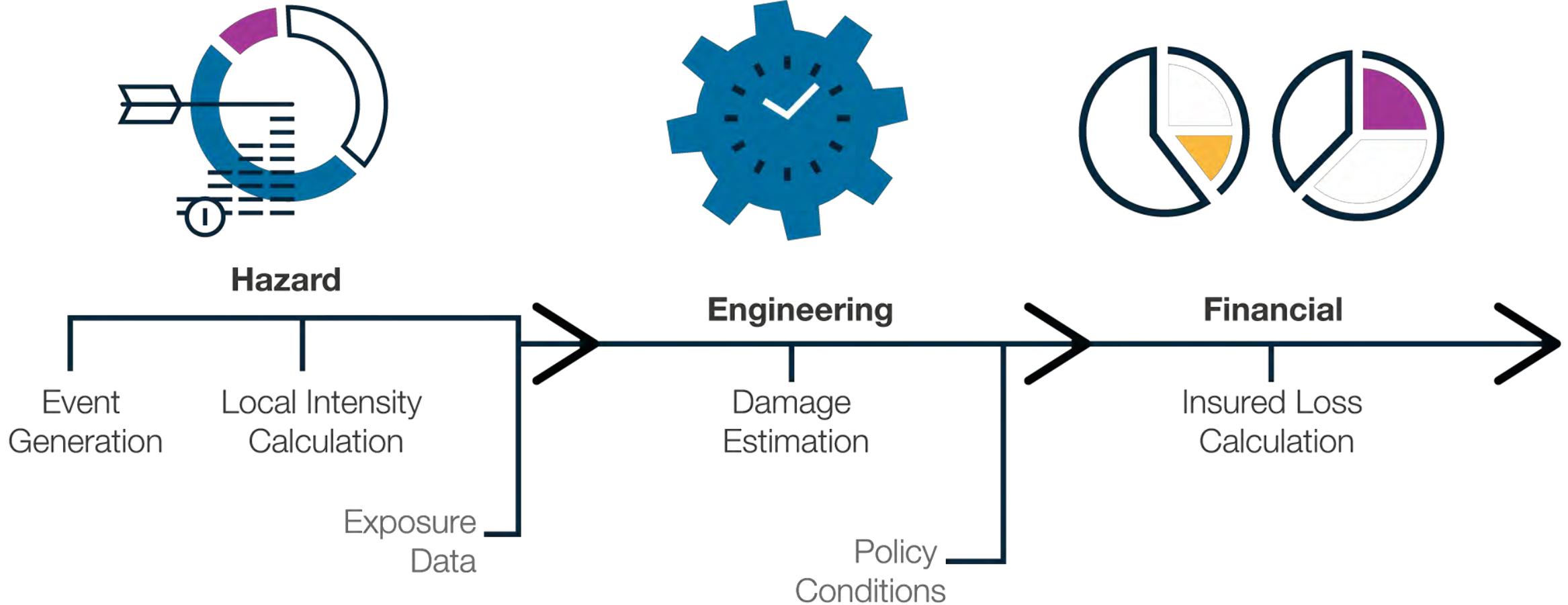
Jun 18, 2018

Climate Change May Already Be Hitting the Housing Market



Risk Analytics

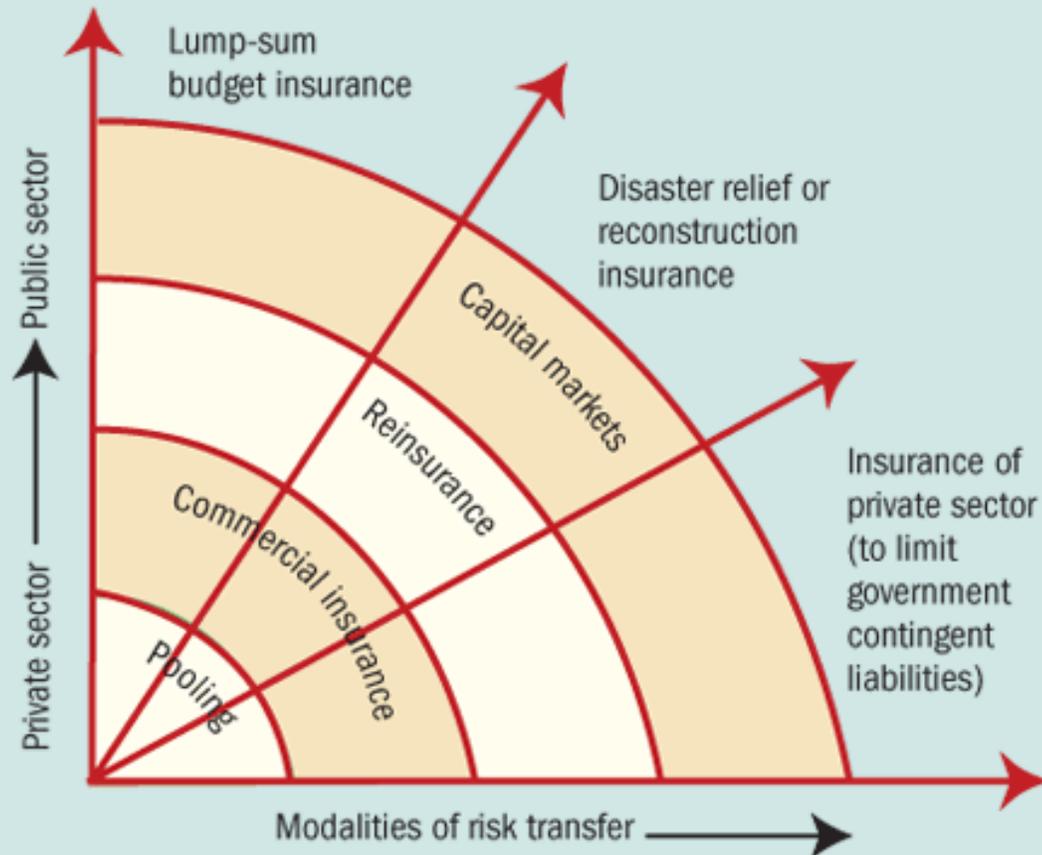
Anatomy of a Cat Model



Rediscovering Insurance as an Institution

The insurance menu

Insurance options can be organized along two key dimensions: the link between public finances and insurance coverage and the modalities of risk transfer.



An organizing framework for risk management

An *institution* of society, not an industry

A means of delivering on legal duties and agreements

A powerful multiplier of impact

A mechanism for incentives and influence



Increasing risk awareness

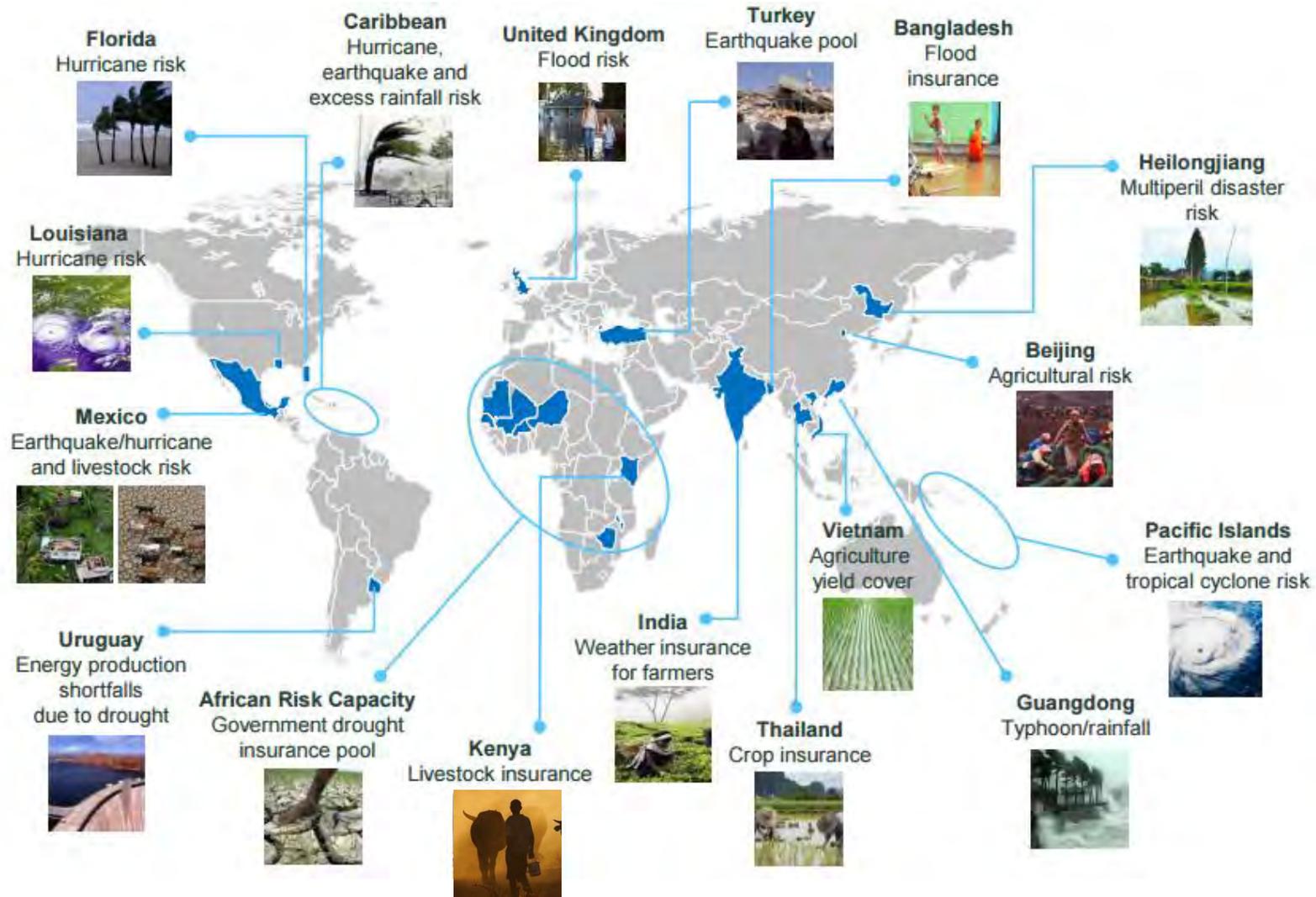


Transferring burden away from society

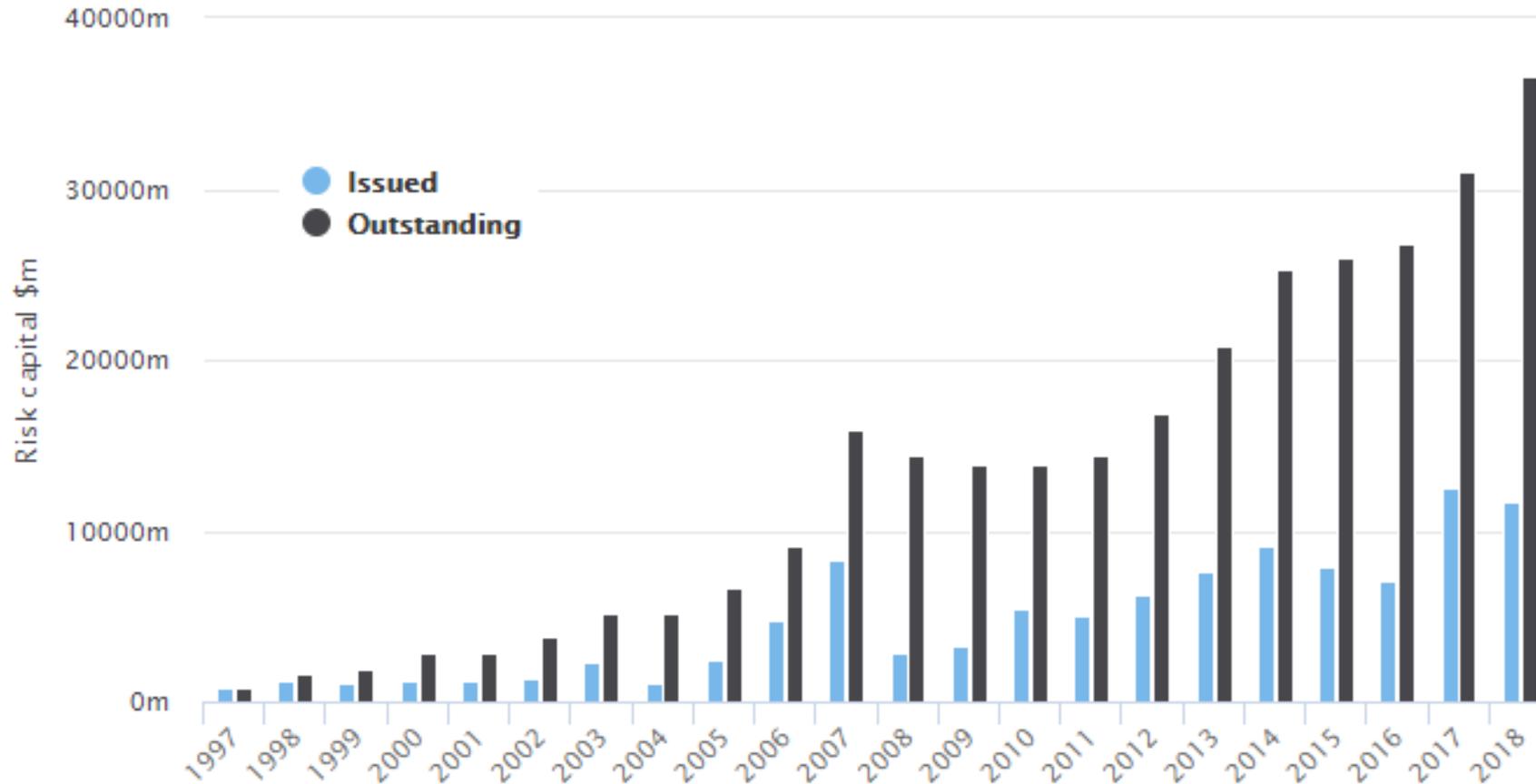


Allocating capital effectively

Innovative Risk Transfer Solutions for the Public Sector



Catastrophe Bond & ILS Risk Capital Issued & Outstanding By Year

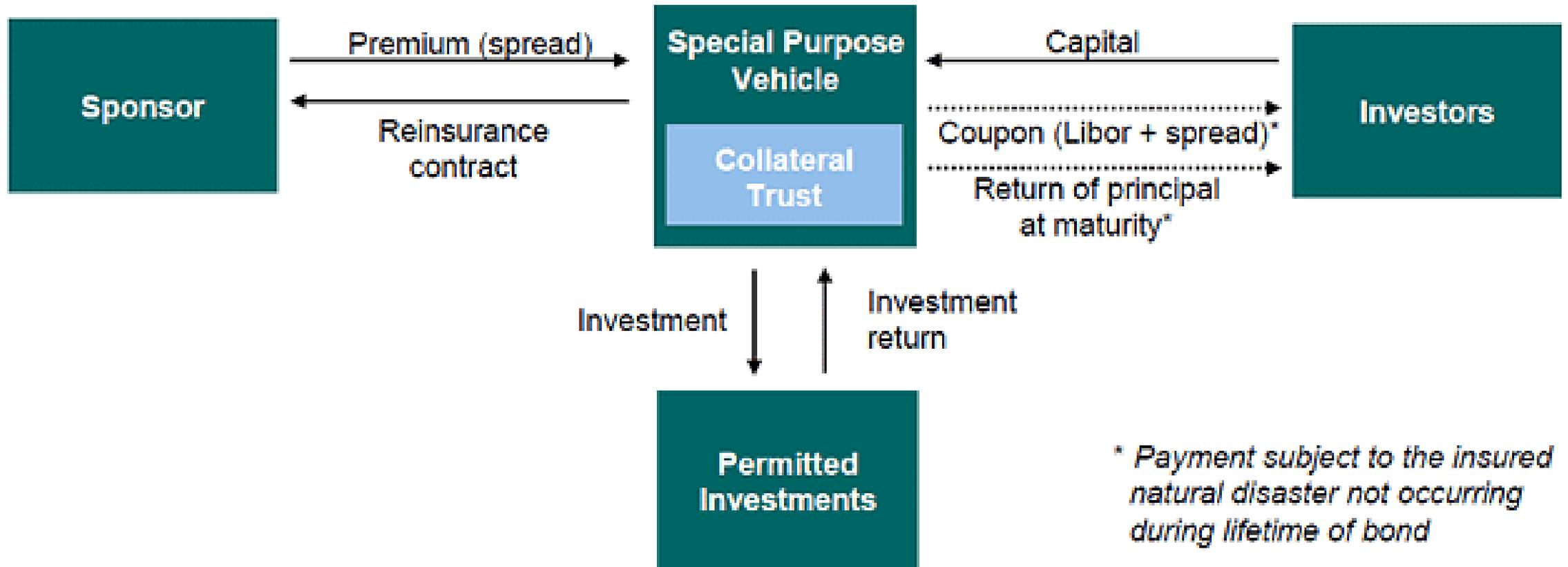


Source: www.Artemis.bm Deal Directory

Catastrophe bond and ILS issuance in Q2 2018 was the second highest ever recorded, at \$5.151 billion.

H1 2018 issuance \$9.39 billion, already the second most active full-year ever recorded

Catastrophe Bonds



The Tools: Indemnity / Parametric Insurance

Indemnity

- Pays on actual loss
- HIGH cost of loss adjustment
- Payment delays due to loss adjustment

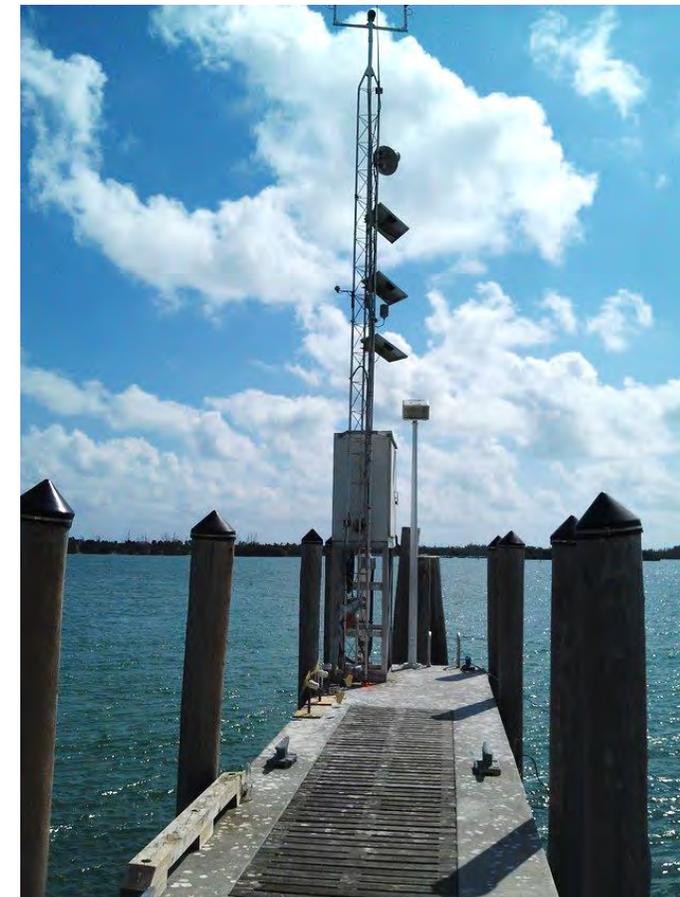
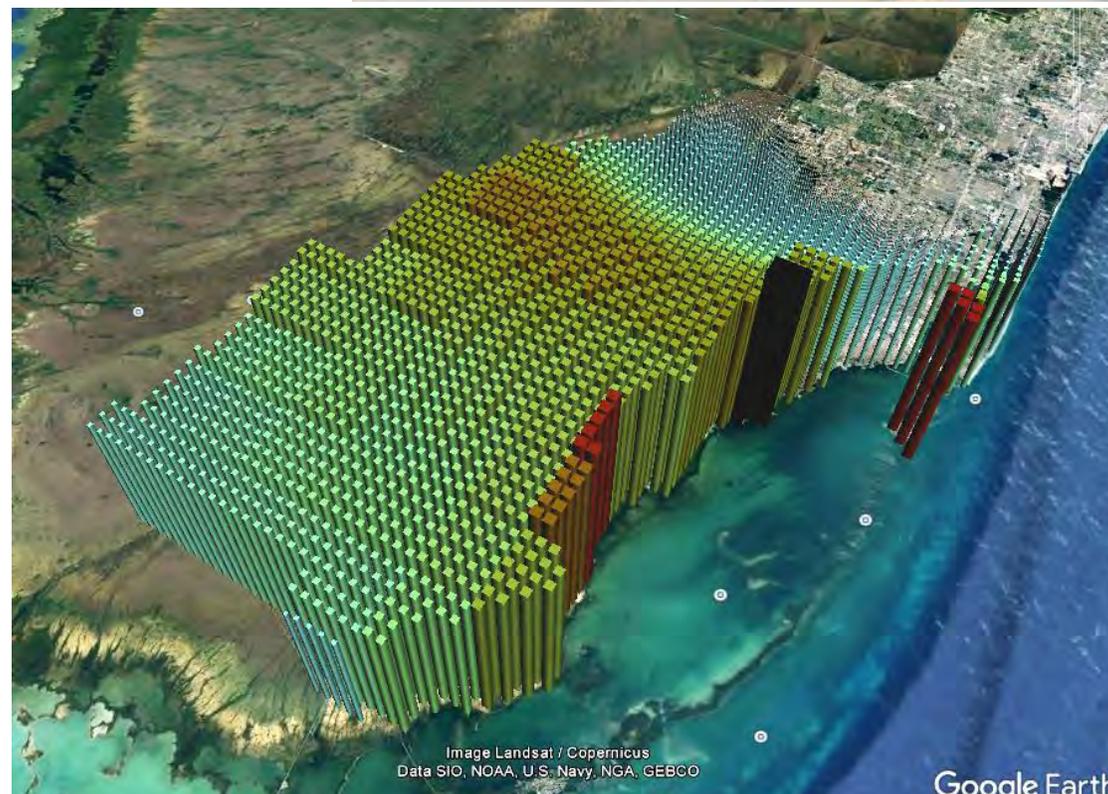
Parametric

- Faster Payment upon triggering event
- Simple, easy to understand
- Event trigger defined by independent agency data (USGS, NOAA)
- Basis Risk



HydroMet Triggers

- Rainfall
- Flow / CFS
- Water Surface Elevation
- Storm Surge
- Barometric Pressure
- Wind Speed



CCRIF – Caribbean Catastrophe Risk Insurance Facility



Celebrating 10 years
**of innovation in catastrophe insurance...
 in the Caribbean and Central America**



Our Members in the Caribbean: Anguilla, Antigua & Barbuda, Barbados, Belize, Bermuda, Cayman Islands, Dominica, Grenada, Haiti, Jamaica, St. Kitts & Nevis, Saint Lucia, St. Vincent & the Grenadines, The Bahamas, Trinidad & Tobago, Turks & Caicos Islands

Our Members in Central America: Nicaragua

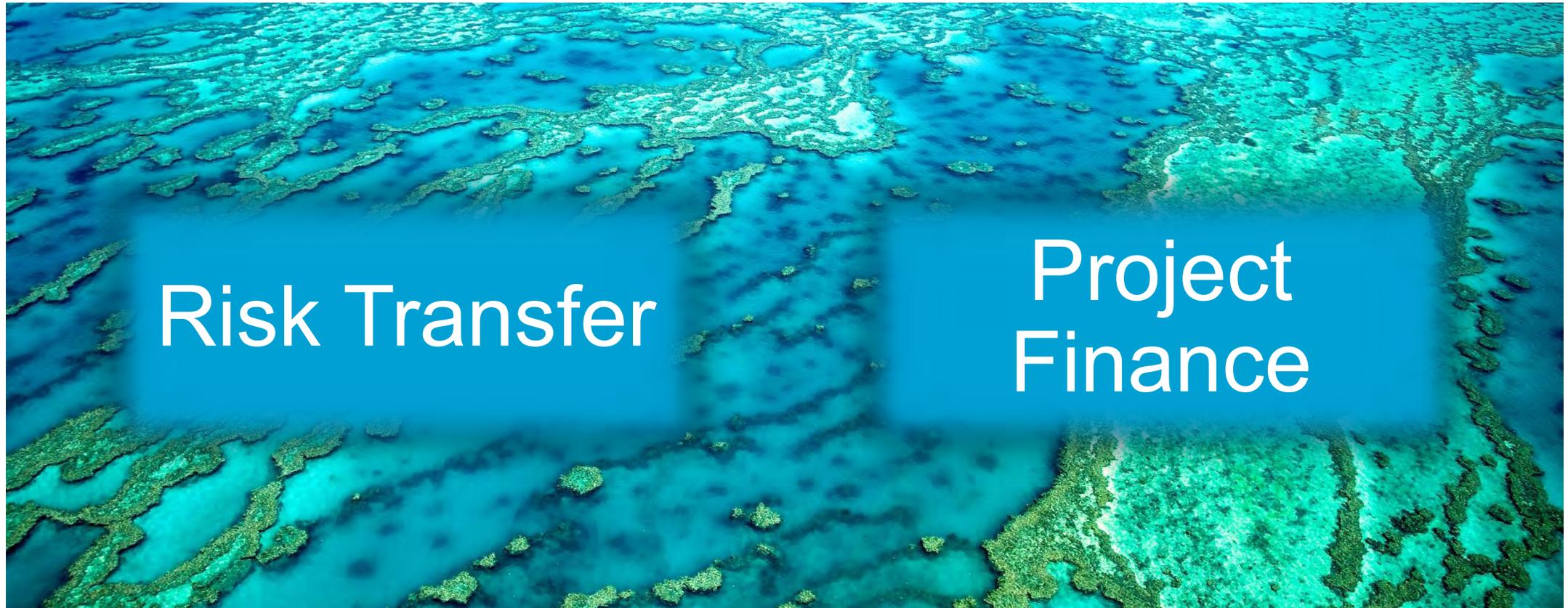
Storm Event	Payouts-To-Date
Hurricane Irma	\$30.8 million
Hurricane Maria	\$23.6 million

Since the inception of the facility in 2007, CCRIF has made payouts totaling US\$130 million to 12-member governments – all made within 14 days of the event.

The Global Ecosystem Resilience Facility (GERF)

A framework for partnerships and collaboration

An umbrella facility to provide two key pillars of innovative finance for ecosystems and natural capital:

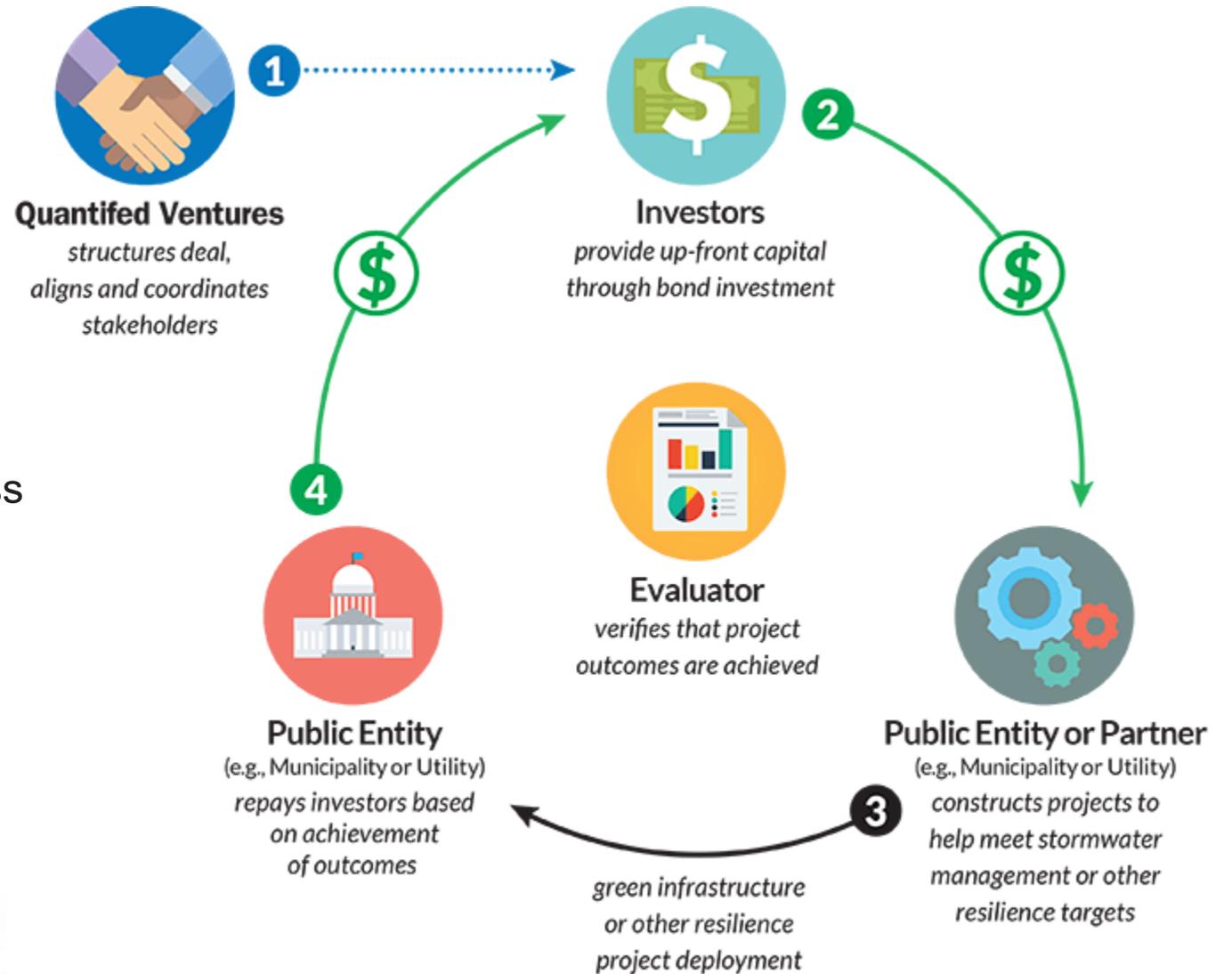


ENVIRONMENTAL IMPACT BONDS

\$25 million Environmental Impact Bond to finance the construction of green infrastructure to manage stormwater runoff

“Pay for Success” financing approach

Limits financial risk to DC Water if the performance of the green infrastructure is less than anticipated and financially rewards investors if the performance exceeds expectations



Resilience Bonds: Leverage Local Capacities & Authorities



Debt Instrument

Raise capital to fund resilience

- Municipal Bond
- Federal Credit or Loan
 - E.g. HUD s.108 Loan, FEMA Community Assistance Loan



Resilience Bond

Risk Transfer

Protect investments

- Uses analytics for deep understanding of extreme risk
- e.g. Catastrophe Bond, Index / Parametric Cover

Columbia Venture, LLC v. Richland County

**THE STATE OF SOUTH CAROLINA
In The Supreme Court**

Columbia Venture, LLC, Appellant,

v.

Richland County, Respondent.

Appellate Case No. 2013-001067

Appeal from Richland County
John Hamilton Smith, Sr., Special Referee

Opinion No. 27563
Heard November 18, 2014 – Filed August 12, 2015

AFFIRMED



© Congaree Riverkeeper

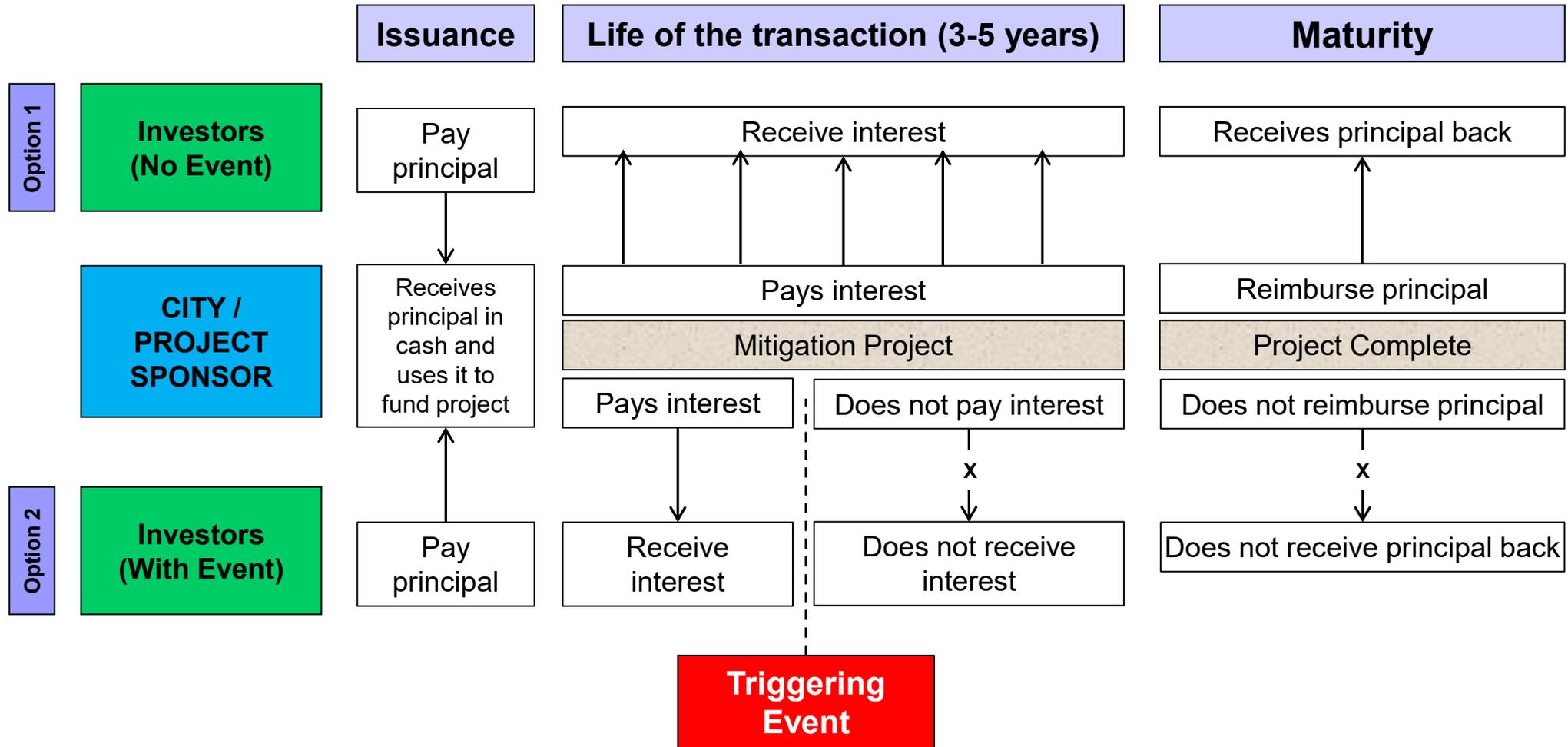
Managing Legal Risks

- ✓ **Tailor Standards to Your Risk Appetite**
- ✓ **What do you know about flood risk in your community?**
 - ✓ Claims
 - ✓ Damage
 - ✓ Disruption
- ✓ **Transparency**
- ✓ **Tie Action to the Risk**
- ✓ **Consistency – Beware variances**
- ✓ **Stakeholders – Engage early and often**
- ✓ **Post-Disaster Moratoria**
- Connect Hazard Mitigation Plans to Comprehensive, Land Use, Zoning**
- “Beyond Code” Standards, e.g. IBHS FORTIFIED™**
- Freeboard & Setbacks**
- No-Rise Floodplains**
- Steep slopes and erosion prone areas**
- Designate floodprone areas as open space today ... and tomorrow, e.g. local land trusts**
- Transferrable Development Rights**

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Resilience Bond Example Structure



■ There is a lot of flexibility in the product and this slide only shows one example

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