

An aerial photograph of a flooded landscape, likely a river delta or coastal area, showing intricate patterns of water and land. Several black rectangular redaction boxes are placed over parts of the image: one in the top right, one in the middle right, one in the bottom right, one in the bottom center, one in the middle left, and one in the bottom left.

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

Samantha Medlock, Esq., CFM

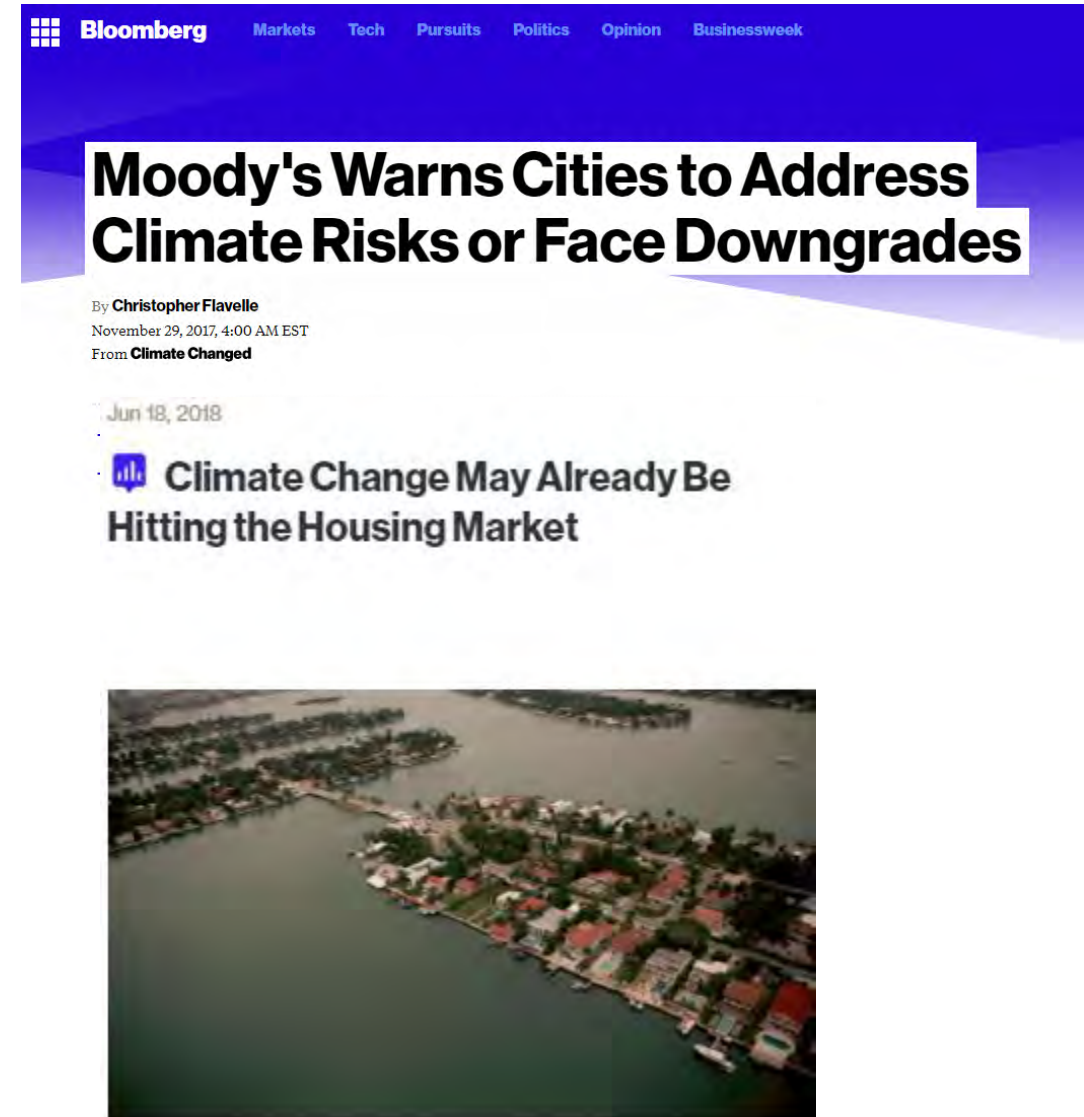
Capital, Science & Policy Practice, Willis Towers Watson

Indiana Association for Floodplain and Stormwater Management

September 7, 2018

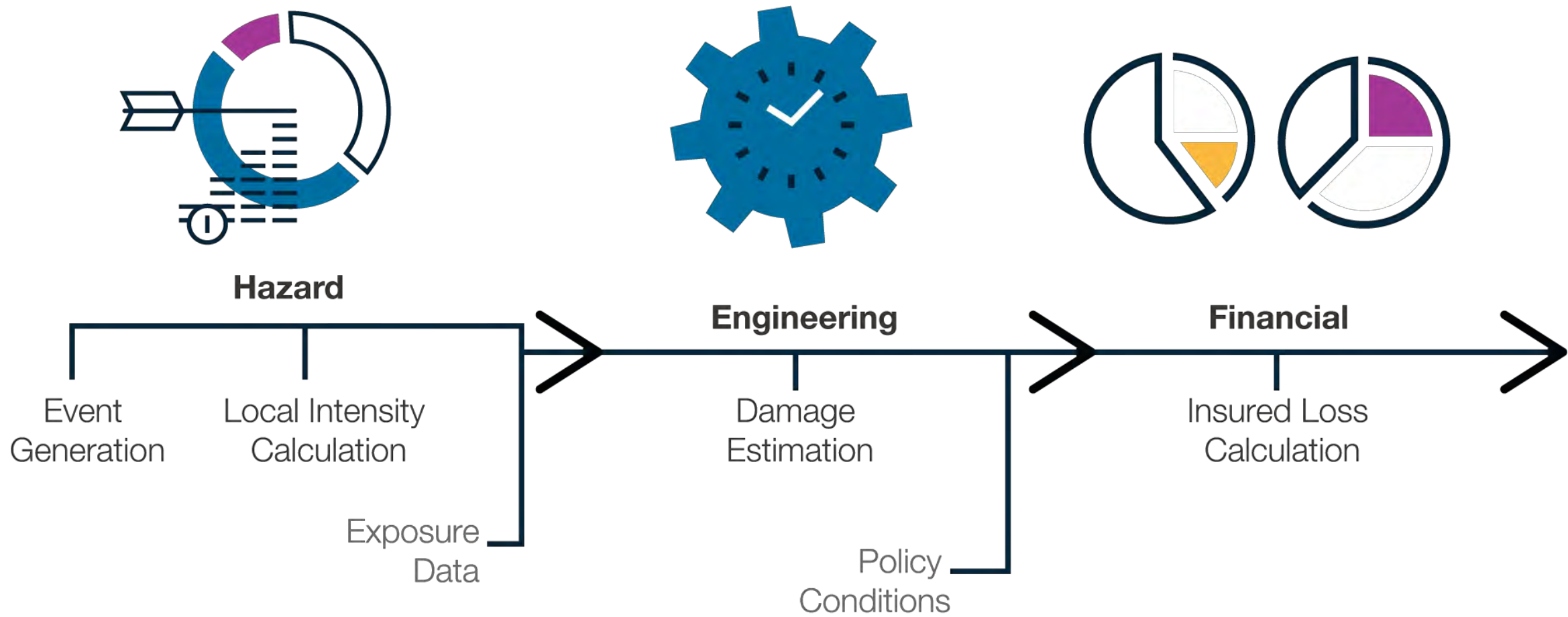
Resilience Finance: Changing Context

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



Risk Analytics

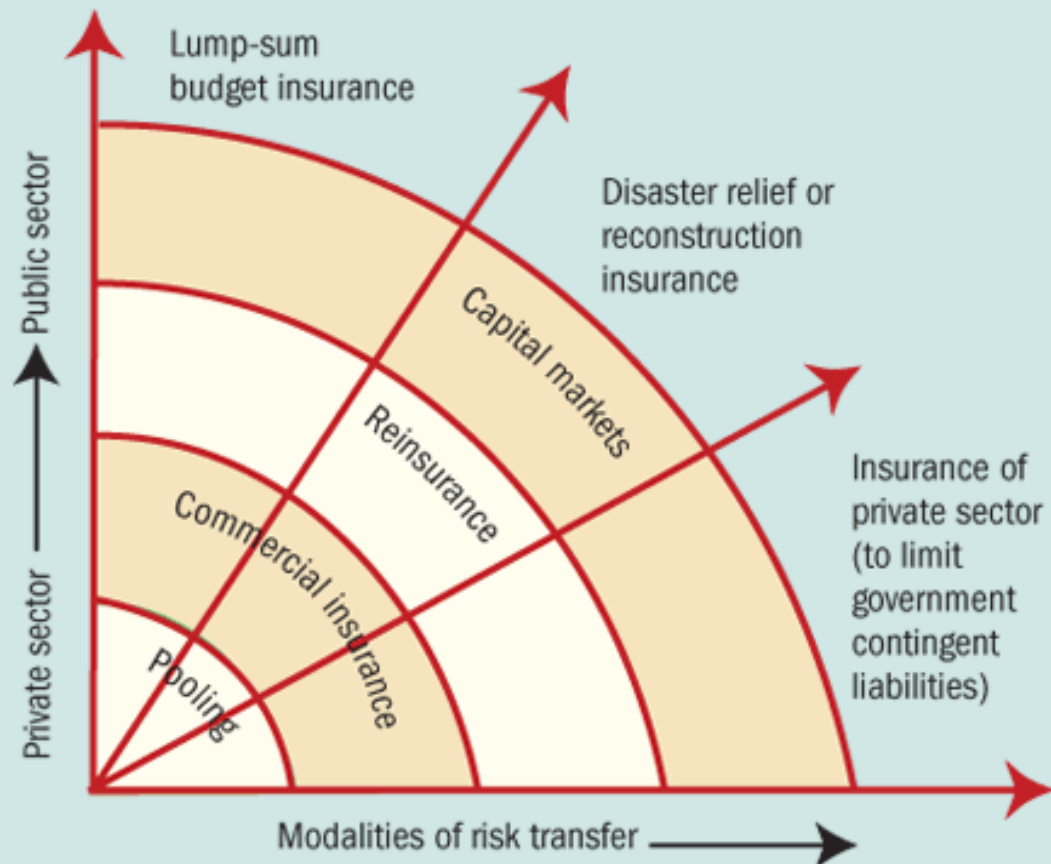
Anatomy of a Cat Model



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

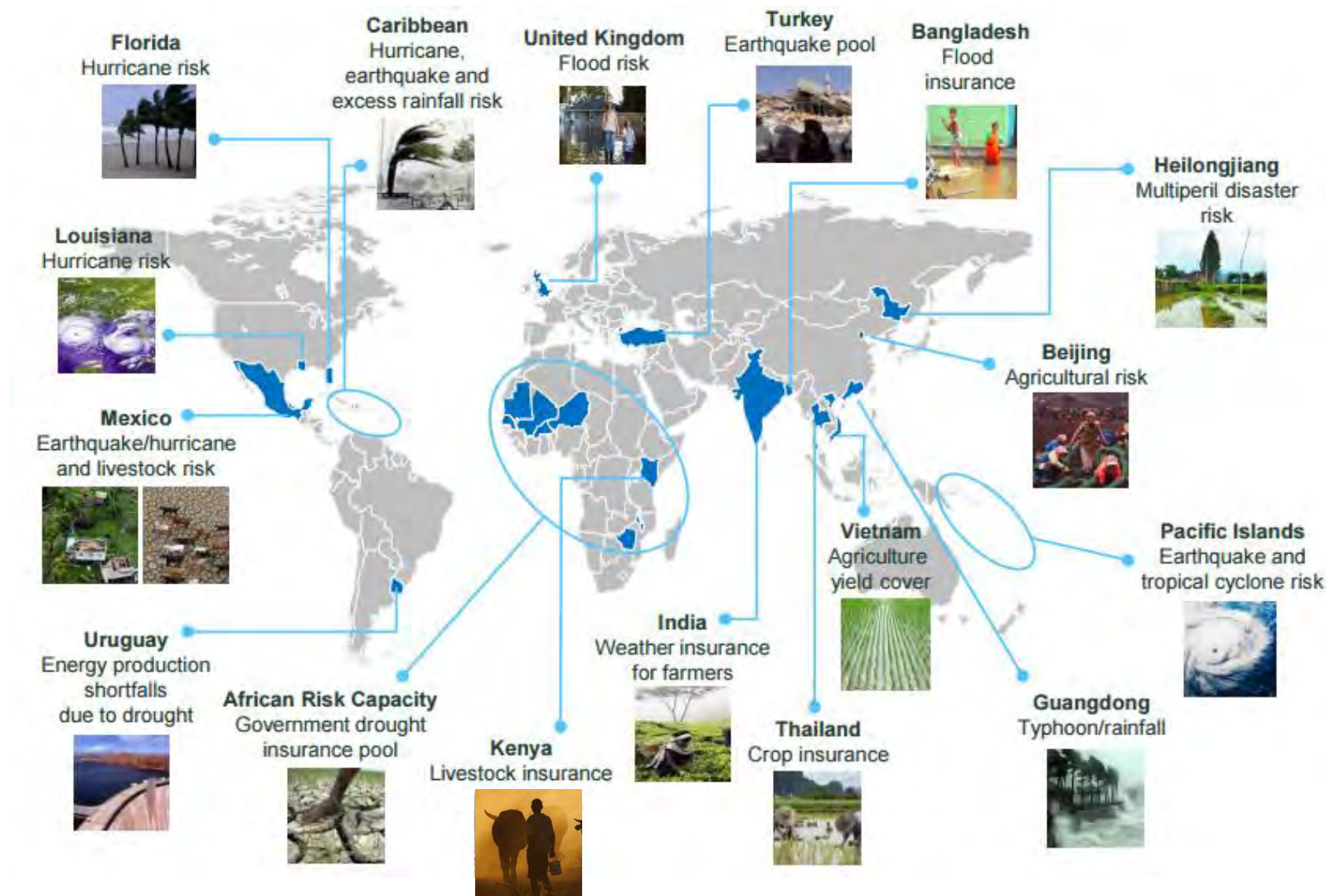


Transferring burden away from society

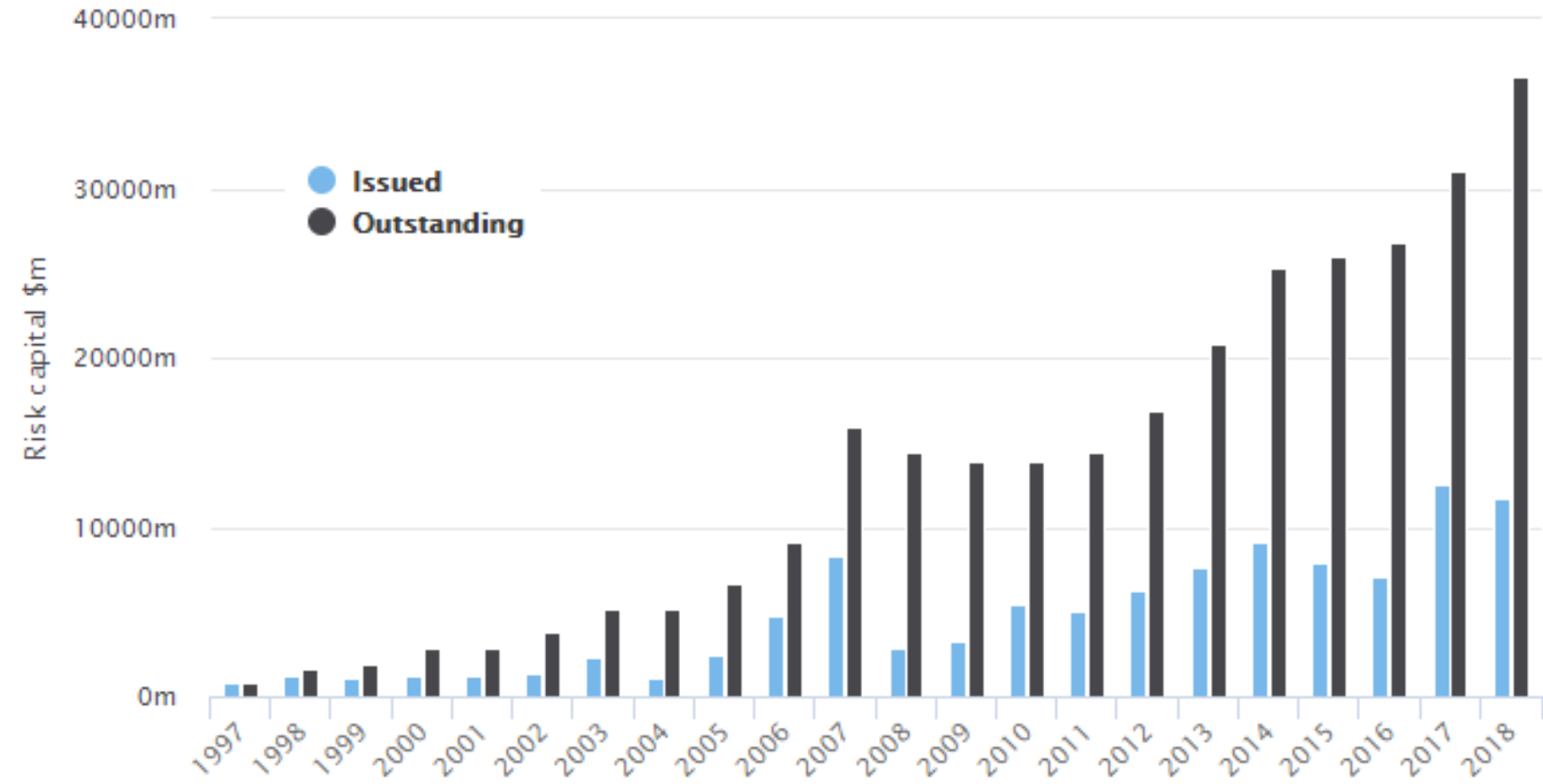


Allocating capital effectively

Innovative Risk Transfer Solutions for the Public Sector



Catastrophe Bond & ILS Risk Capital Issued & Outstanding By Year

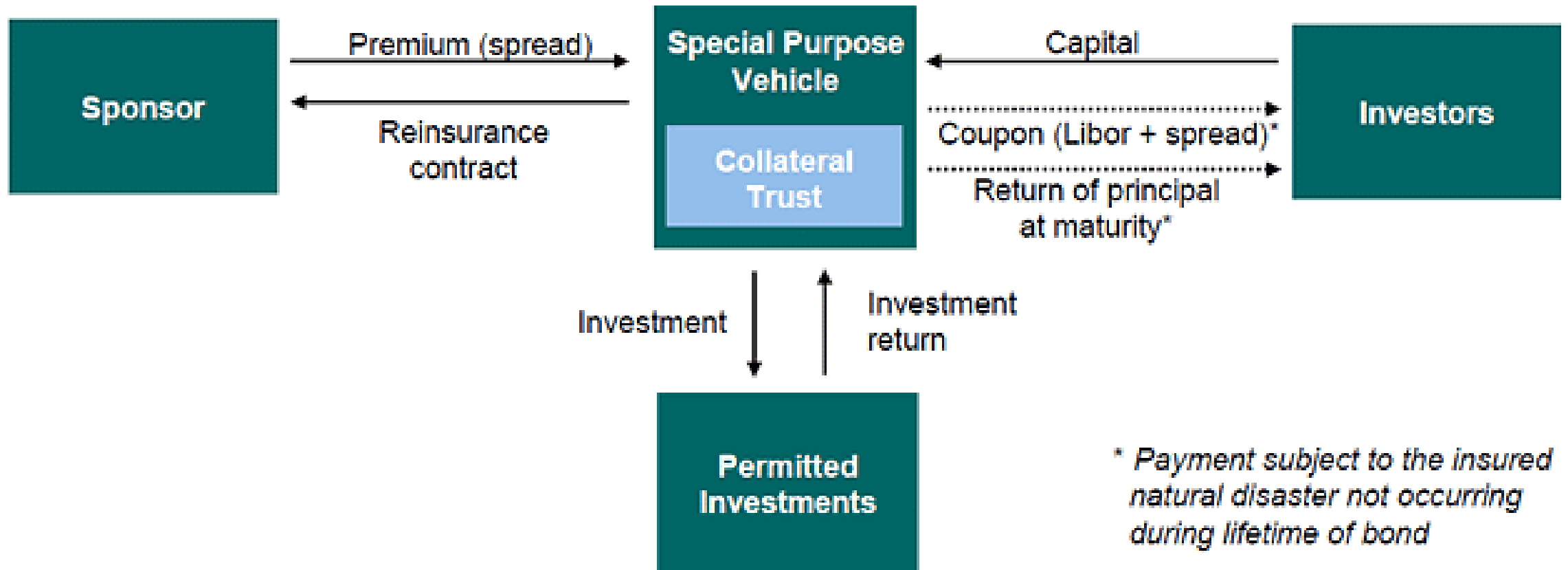


Source: www.Artemis.bm Deal Directory

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

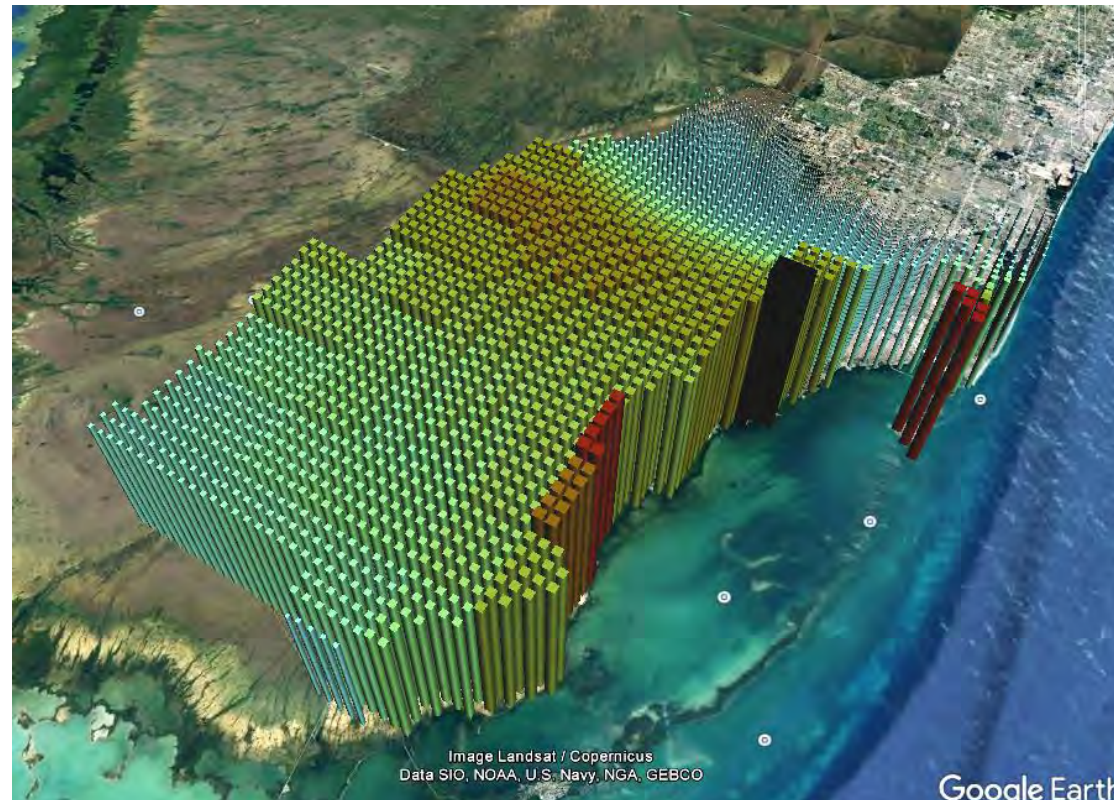
Parametric

- 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

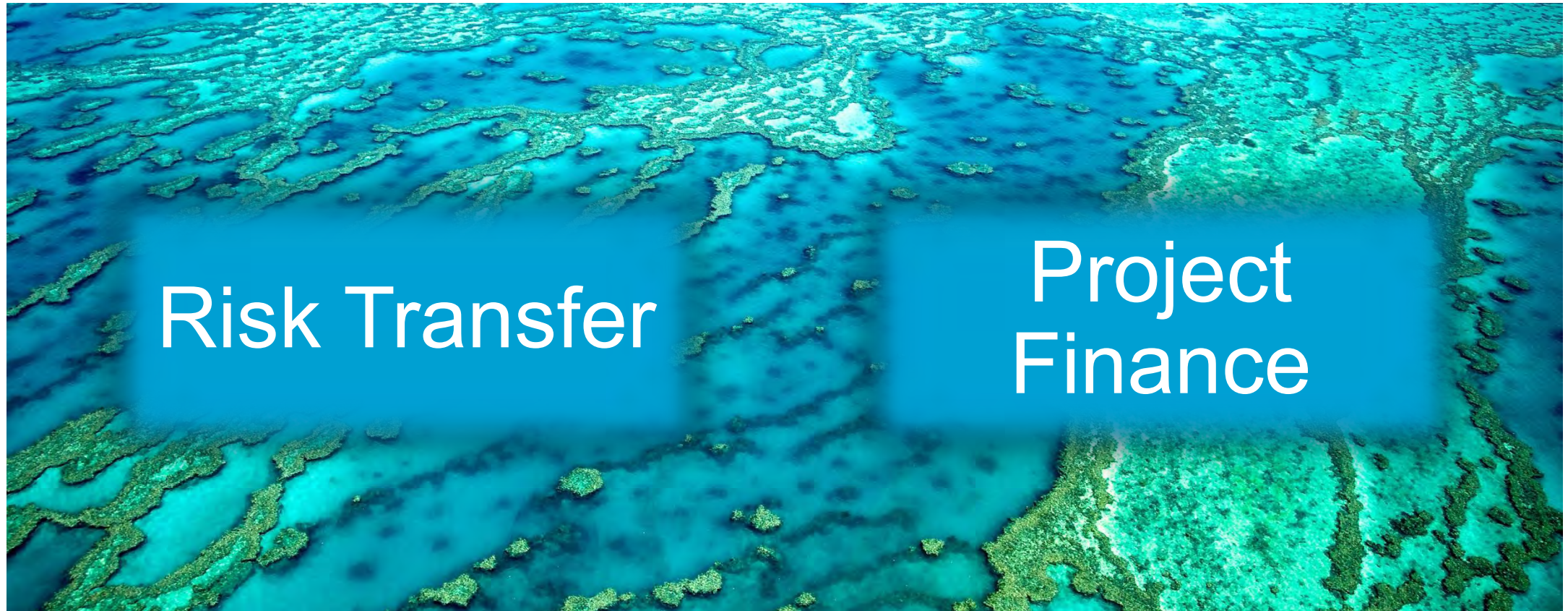
Storm Event	Payouts-To-Date
Hurricane Irma	\$30.8 million
Hurricane Maria	\$23.6 million

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:

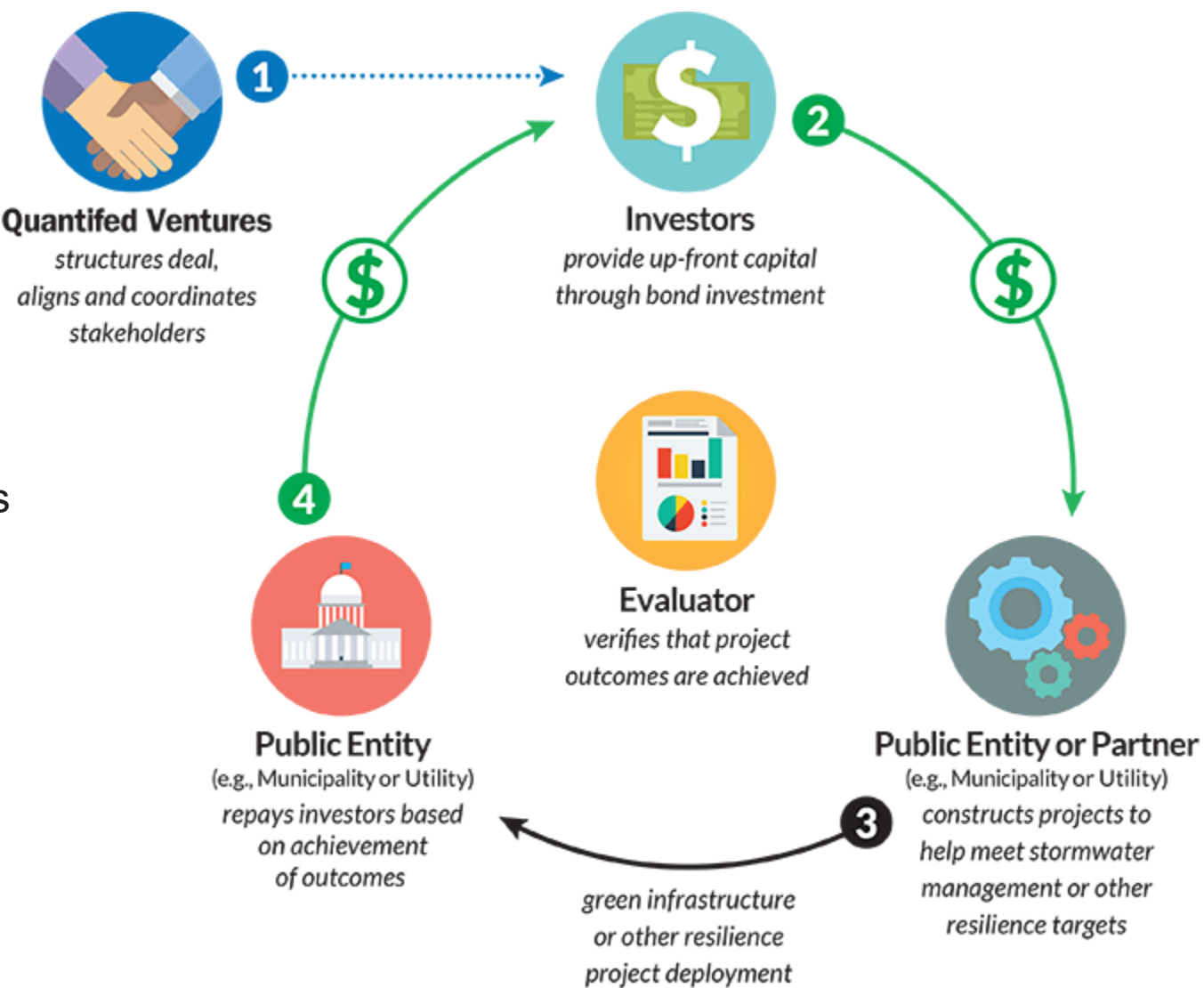


ENVIRONMENTAL IMPACT BONDS

\$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



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

Lawsuits filed re Addicks & Barker Reservoir Releases

2017-57831 / Court: 080

9/3/2017 8:19 PM
Chris Daniel - District Clerk Harris County
Envelope No. 19216112
By: Justina Lemon
Filed: 9/5/2017 12:00 AM

CAUSE NO. _____

VAL ANTHONY ALDRED, HAGAN
HAMILTON HEILIGBRODT,
WILLIAM LANGE KRELL, JR.,
BEVERLY FECEL KRELL, AND
SHAWN S. WELLING
Plaintiffs,

IN THE DISTRICT COURT OF

HARRIS COUNTY, TEXAS

V.

HARRIS COUNTY FLOOD CONTROL
DISTRICT AND THE CITY OF
HOUSTON,
Defendants

JUDICIAL DISTRICT

PLAINTIFFS' ORIGINAL PETITION

TO THE HONORABLE JUDGE OF SAID COURT:

COME NOW, Val Anthony Aldred, Hagan Hamilton Heiligbrodt, William Lange Krell, Jr., Beverly Fece Krell, and Shawn S. Welling (collectively referred to as "Plaintiffs"), and file this Original Petition against Defendants Harris County Flood Control District and The City of Houston, and would respectfully show as follows:



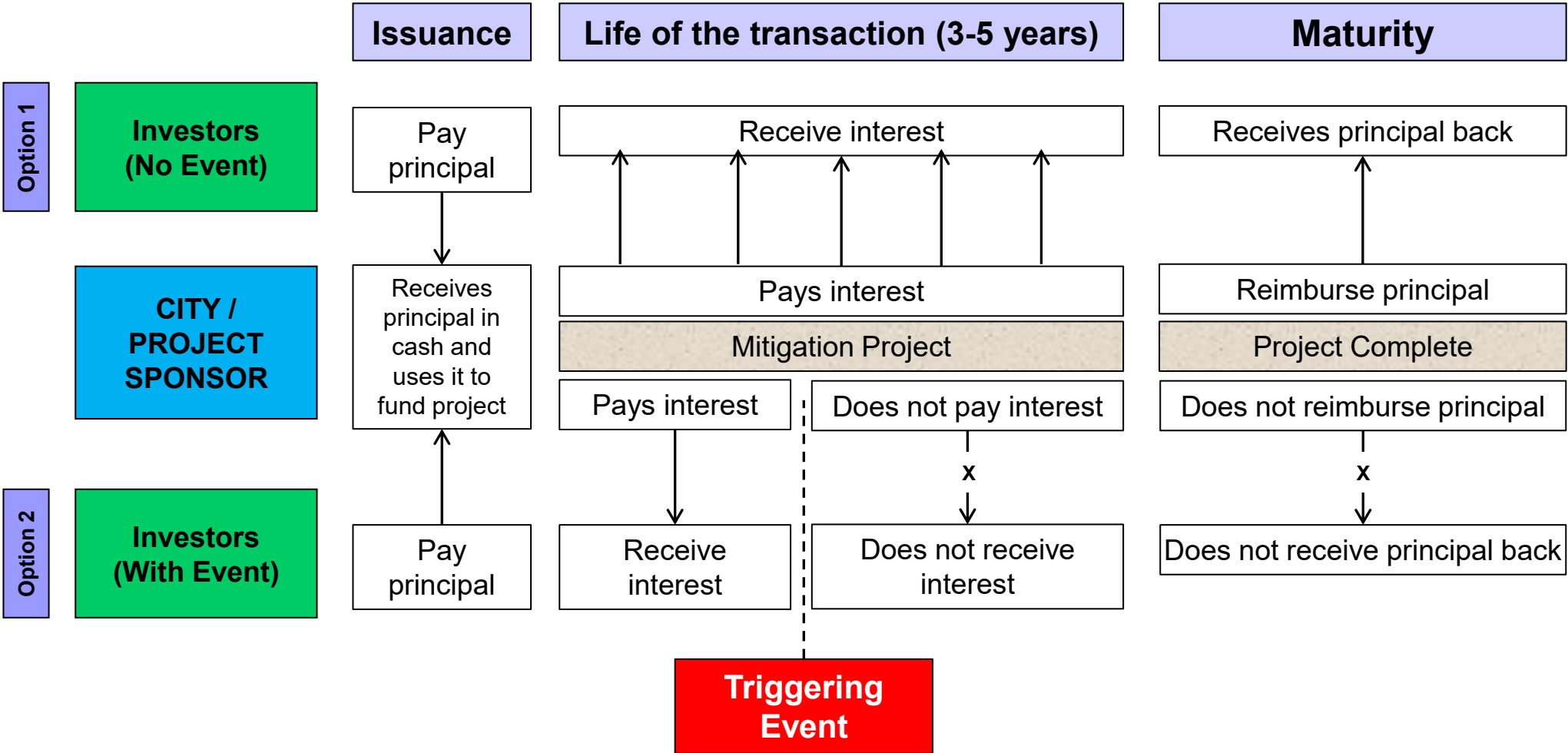
Managing Legal Risks

- ✓ **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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