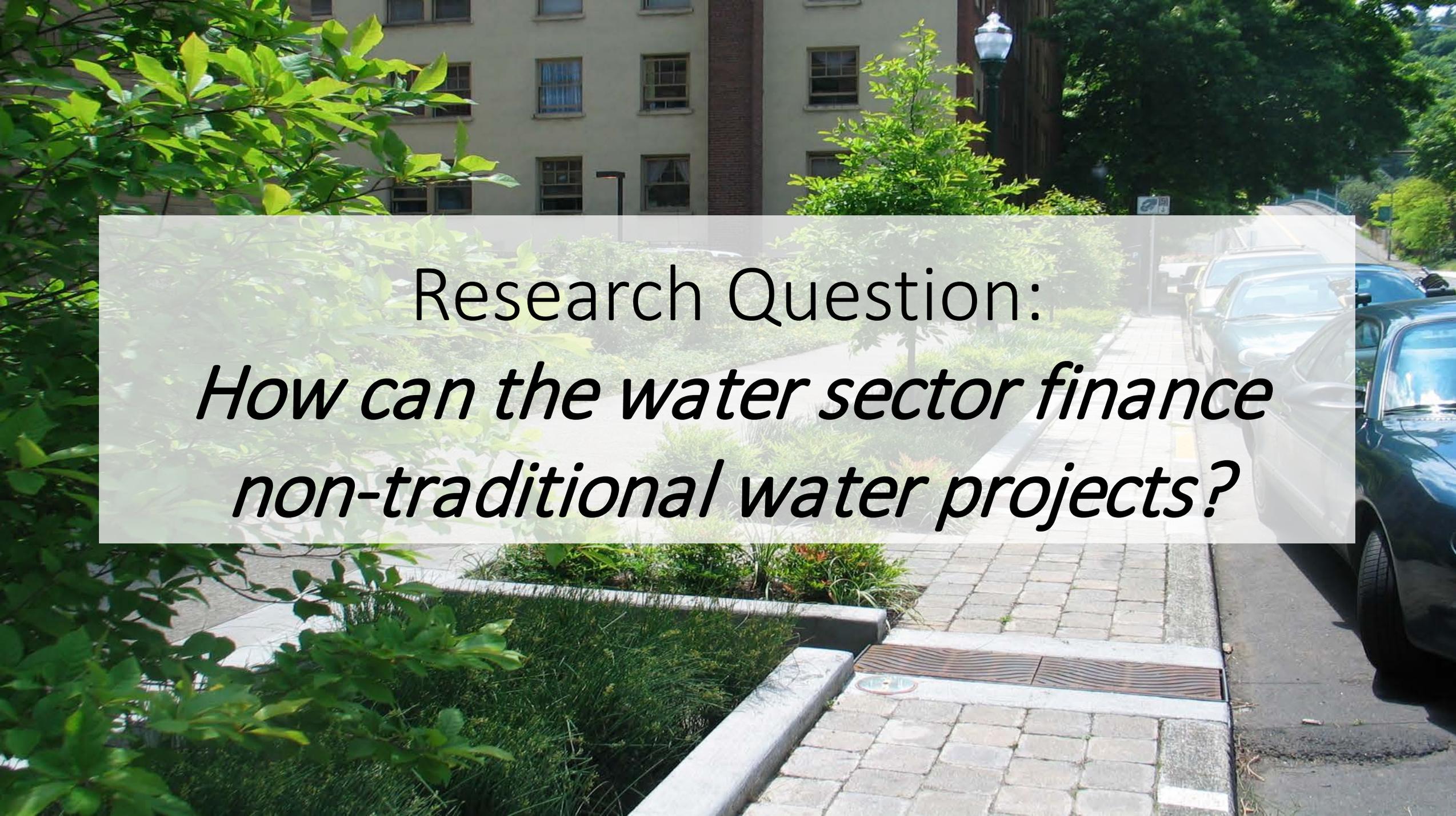


An aerial photograph of a modern, multi-story building with a prominent rooftop garden. The garden is filled with various green plants, trees, and a central circular feature. The building's facade is visible on the left, showing large windows and balconies. The background shows other high-rise buildings in an urban setting.

Financing Stormwater Projects: Providing an Innovative Vision

Newsha Ajami, PhD
Stanford University
EPA Region 9 Finance Forum
April 5th, 2017



Research Question:
*How can the water sector finance
non-traditional water projects?*

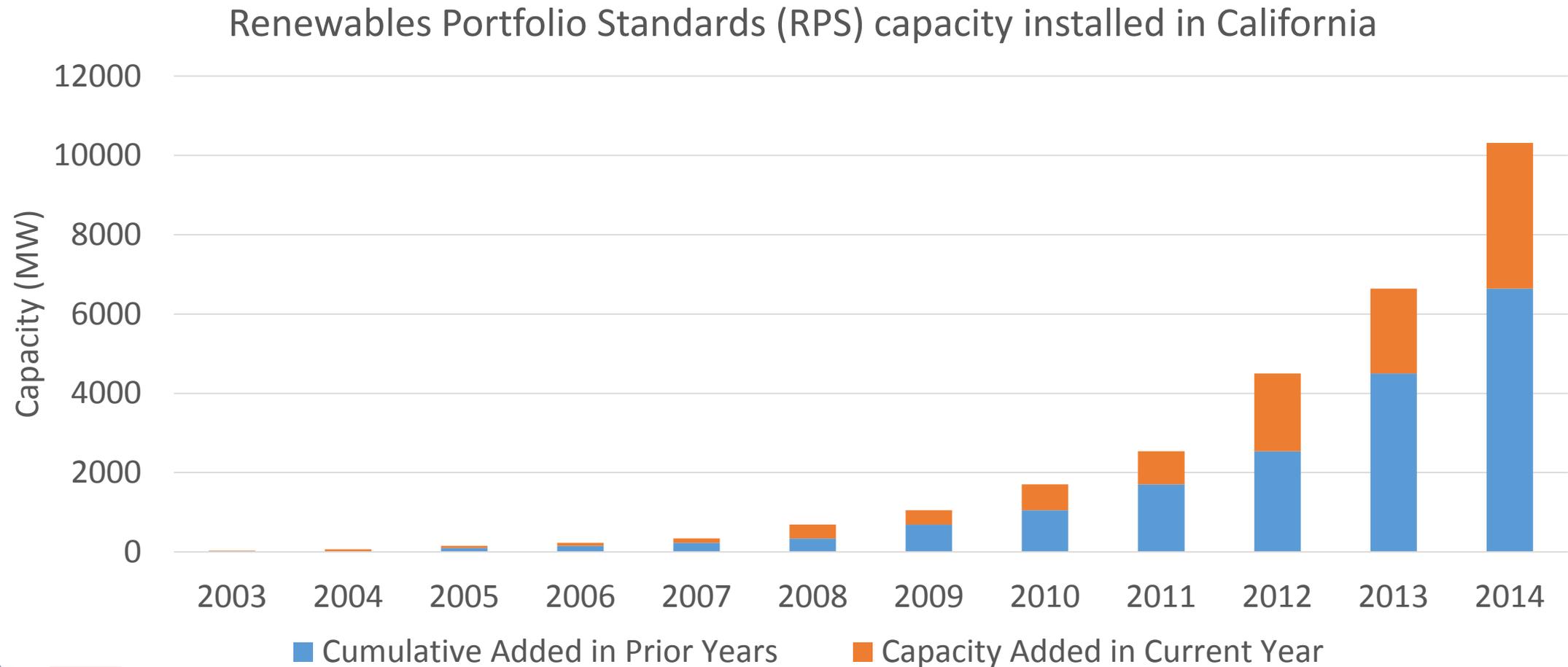
Methodology

1. Gather case studies of non-traditional (innovative, multipurpose, and small- to medium-scale) infrastructure projects
2. Identify common elements among case studies
3. Create a financing framework
4. Identify funding mechanisms we believe could be **most useful to the water sector**



Looking to the Electricity Sector

Evolution of the Electricity Sector



Source: California Public Utilities Commission 2015b

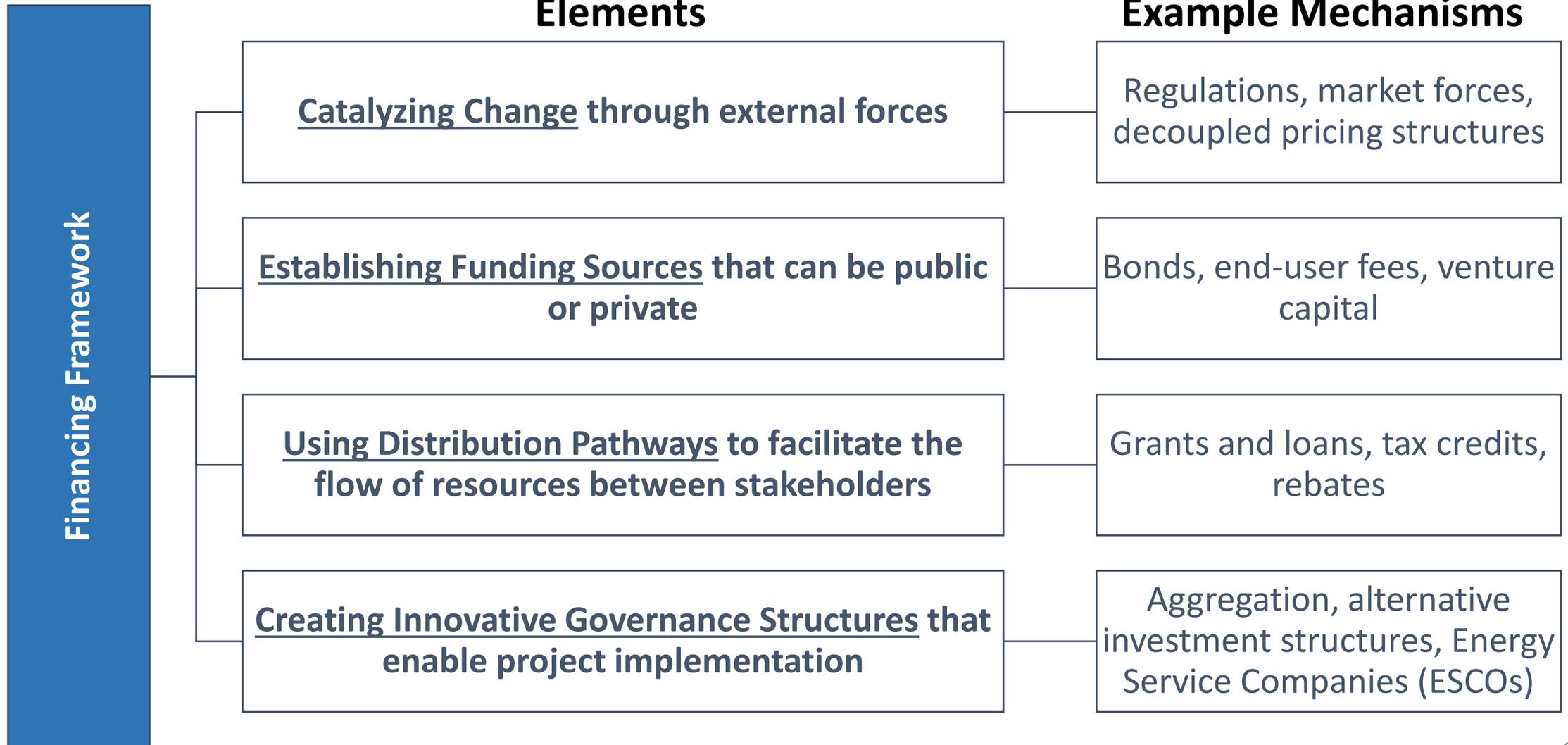
Evolution of the Electricity Sector: Overcoming Barriers

- Limited access to traditional public funding resources
- Difficult to secure private investments
- Regulatory challenges
- Perception towards change

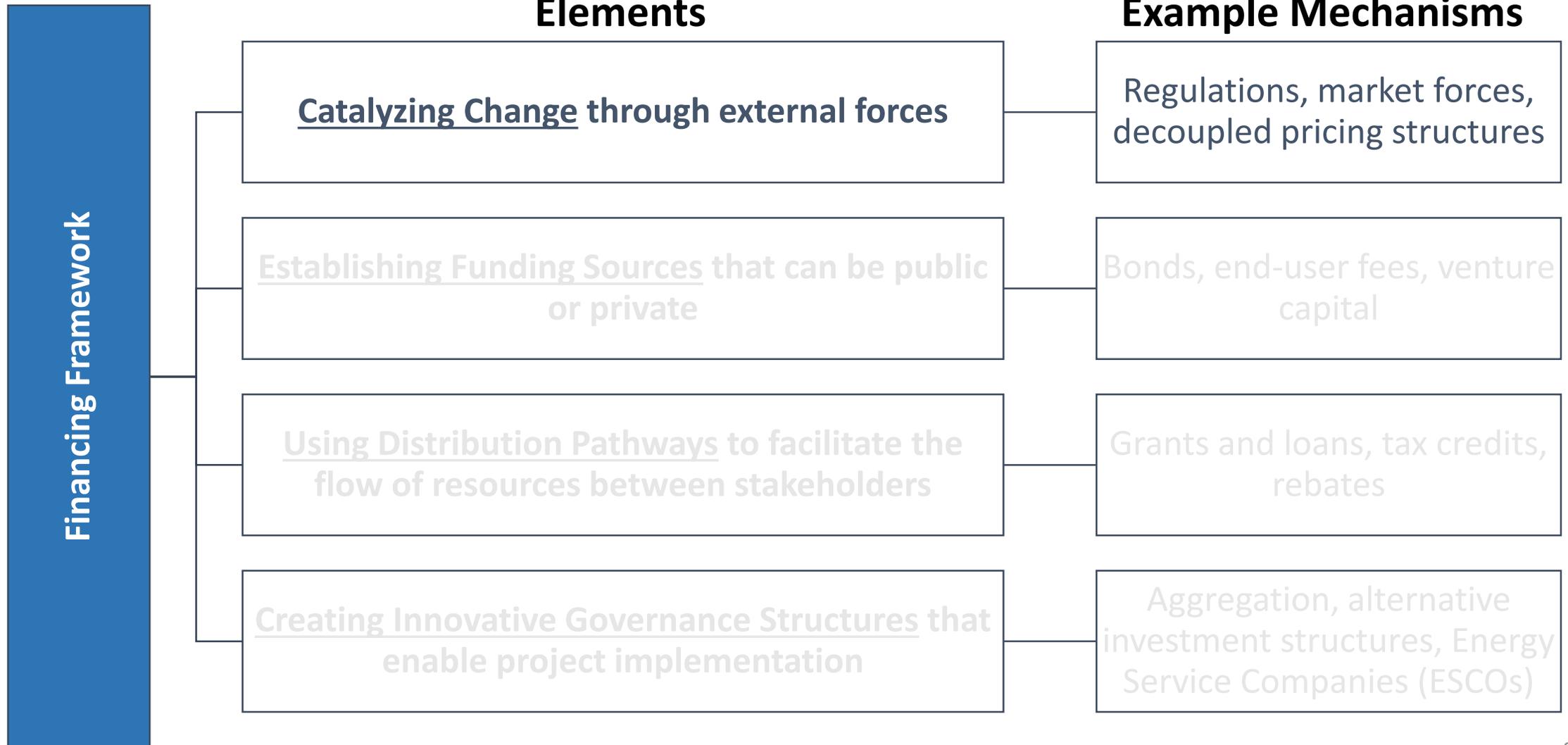


Financing Framework

Financing Framework



Financing Framework



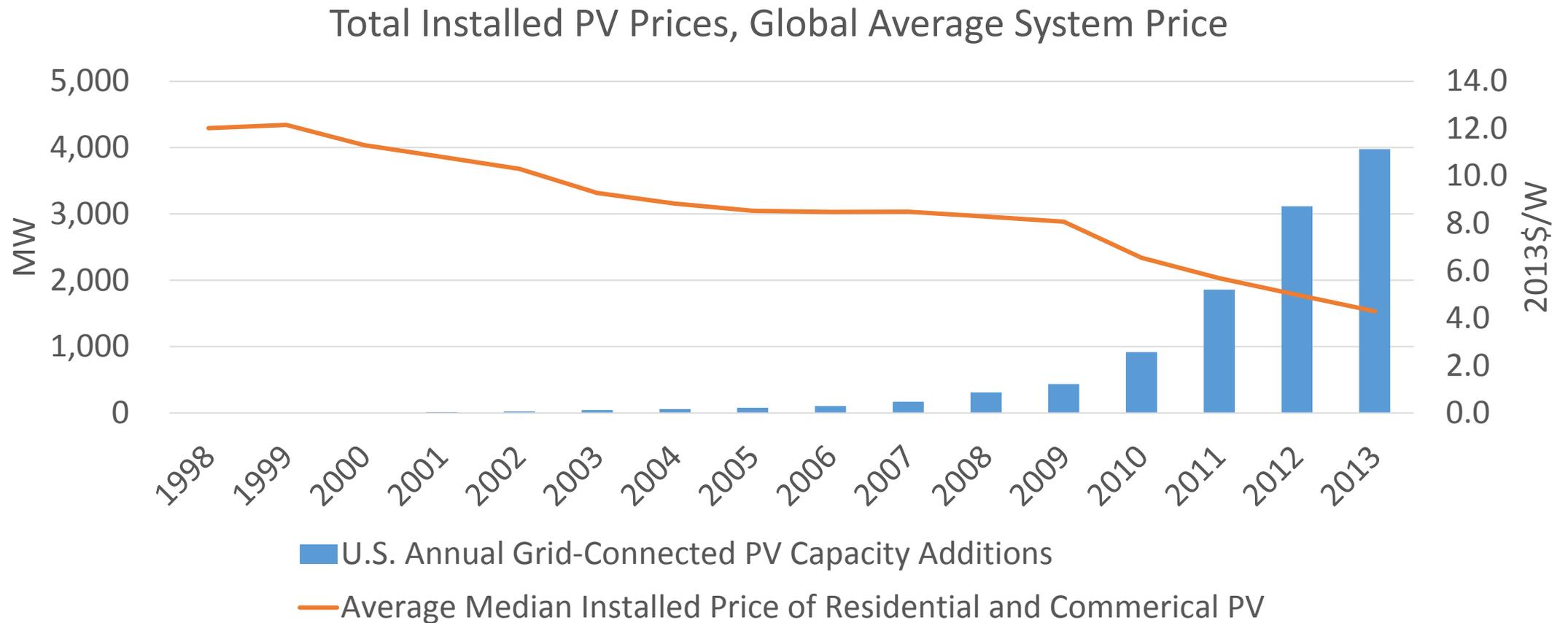
1. Catalyzing Change

- Regulations
- Market Forces
- Price Structuring and Revenue Decoupling

Policies and economic forces drive change

1. Catalyzing Change

Passive Economic Incentives



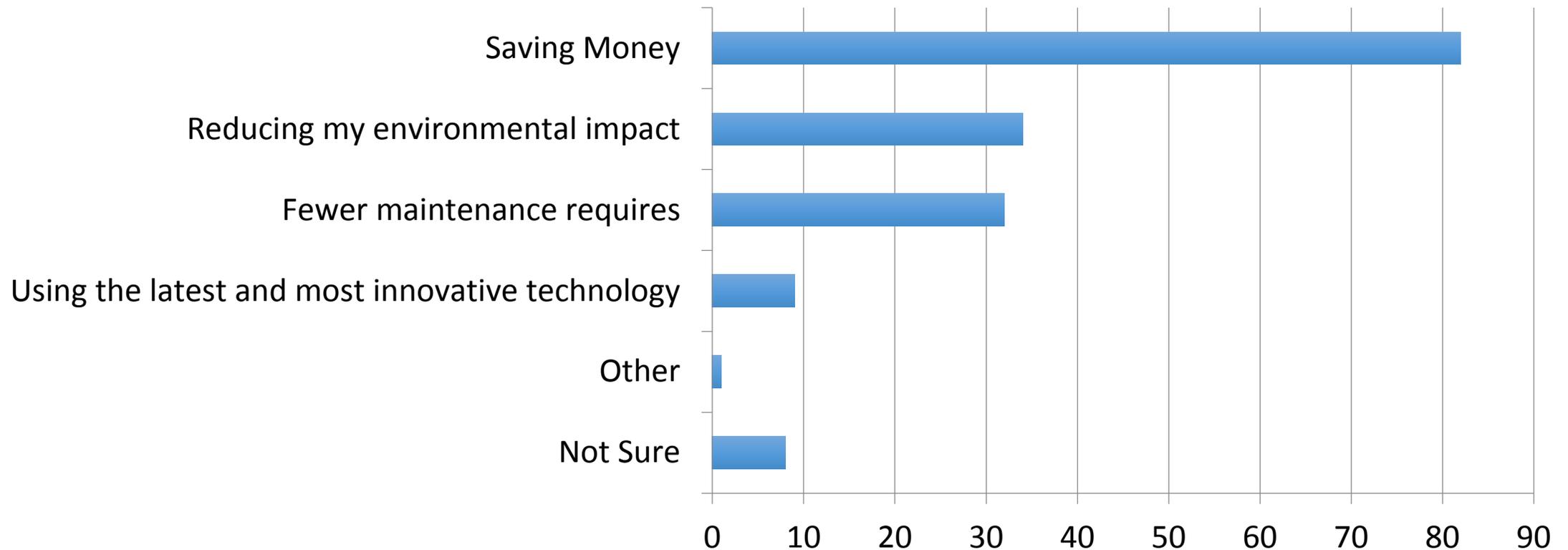
Source: Barbose, G. Weaver, S. & Darhouth, N. (2014)

Note: Price is average of median of all sizes (<10, 10-100, >100 MW) and from a sample of data.

1. Catalyzing Change

Active Economic Incentives

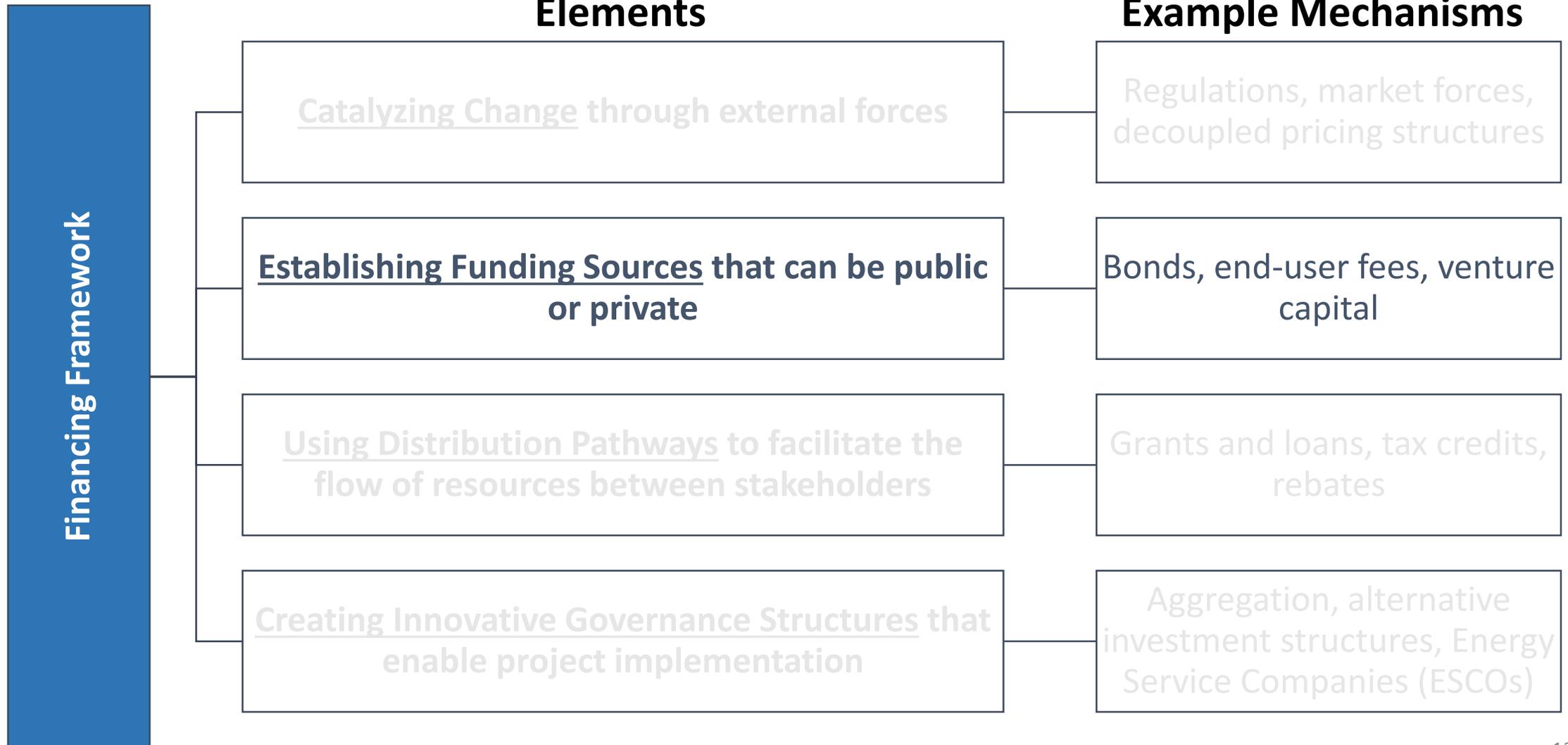
Reasons that Customers Purchase Clean Energy Devices and Appliances



Source: U.S. Homeowners on Clean Energy: A National Survey. 2015 Poll Results and Clean Energy Growth Trends. Solar City and Clean Edge

Note: Survey respondents were asked the following question: "When making decisions around purchasing clean-energy products and services, which of the following are your primary motivators? (Choose up to two)"

Financing Framework



2. Establishing Funding Sources

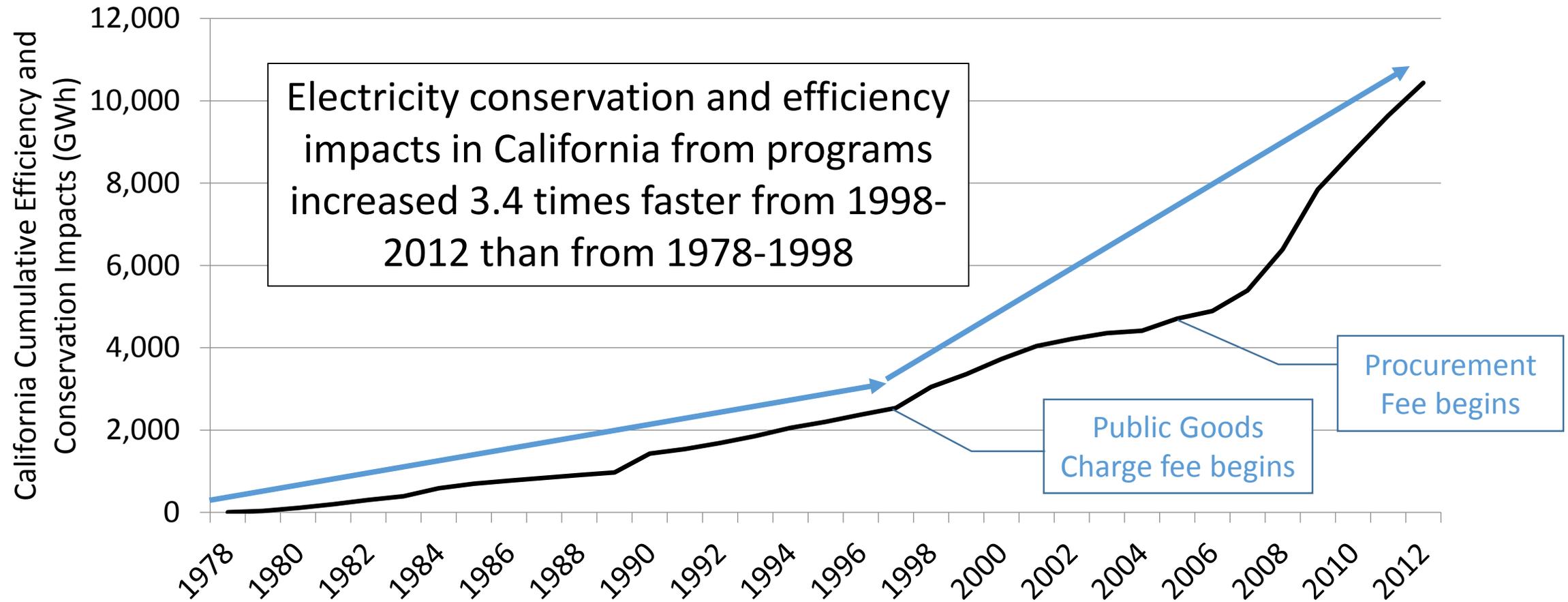
- **Public Sources**

- Taxes
- Bonds
- Revolving Funds
- End-User Fees

- **Private Sources**

Look beyond traditional
funding sources

2. Establishing Funding Sources End-User Fees

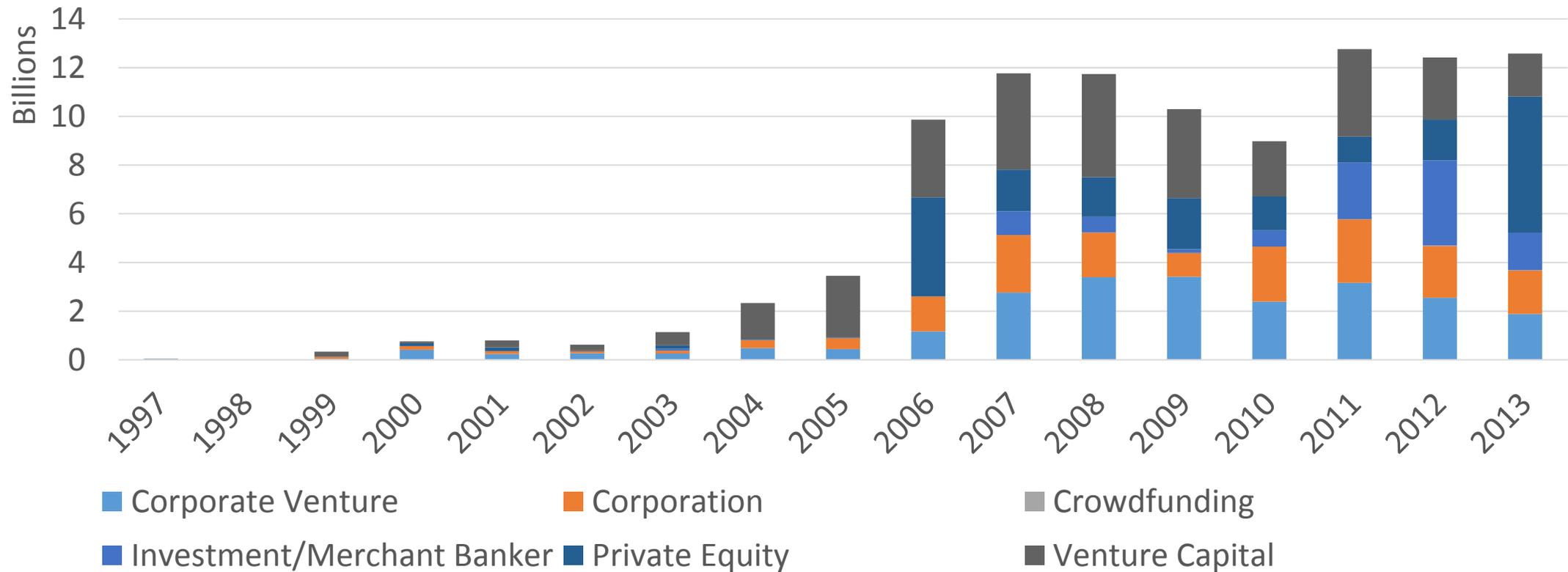


Source: California Energy Commission 2013

2. Establishing Funding Sources

Private Capital

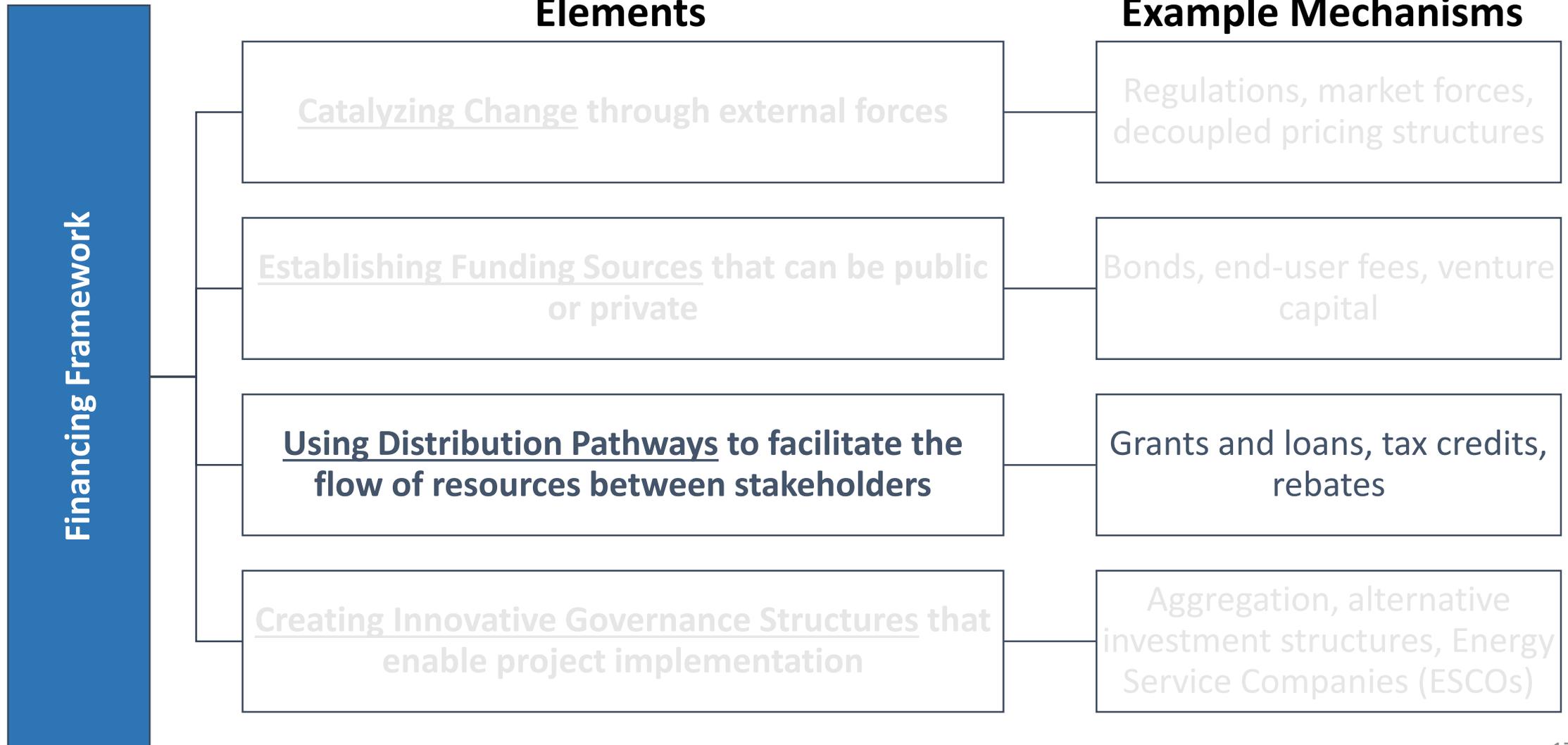
U.S. Private Investment in Clean Energy



Source: Cleantech Group 2014

Note: Clean energy = biomass generation + energy efficiency + energy storage + solar + wind + geothermal + nuclear + hydro & marine + smart grid. Non-private categories of investment not shown here are debt funds, public sector funding, and other.

Financing Framework

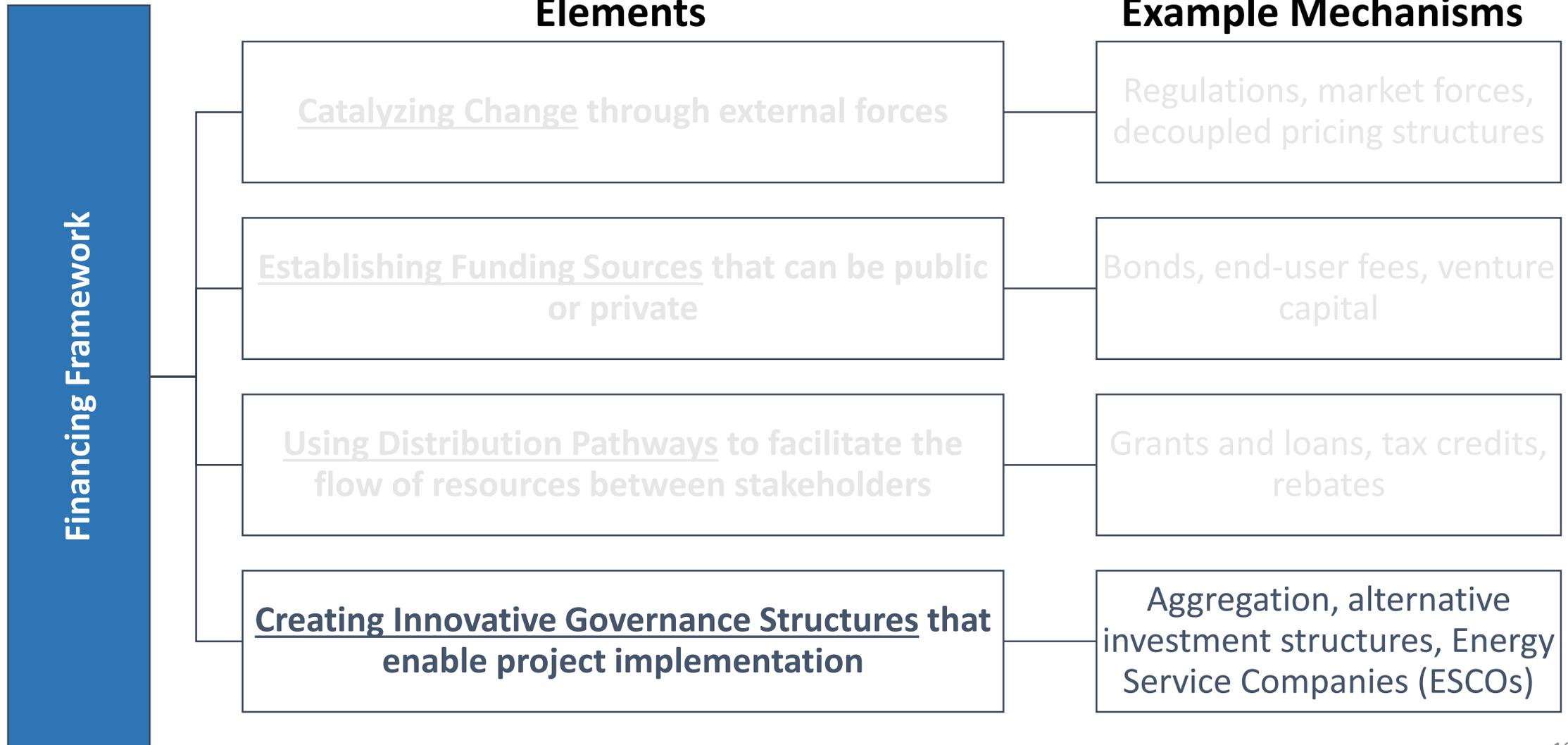


3. Using Distribution Pathways

- Government Grants and Loans
- Rebates
- Tax Credits
- **On-Bill Initiatives**

Mechanism	Financial Backer	Repayment Mechanism
On-Bill Financing (OBF)	Utility shareholders, utility ratepayers, public	Utility bills
<div style="border: 1px solid blue; padding: 10px; display: inline-block;"> <p>Cost-sharing with end-users encourages participation</p> </div>		
(OBR)		Utility bills
Property Assessed Clean Energy (PACE)	Private investors through bonds	Property tax bills and assessments

Financing Framework

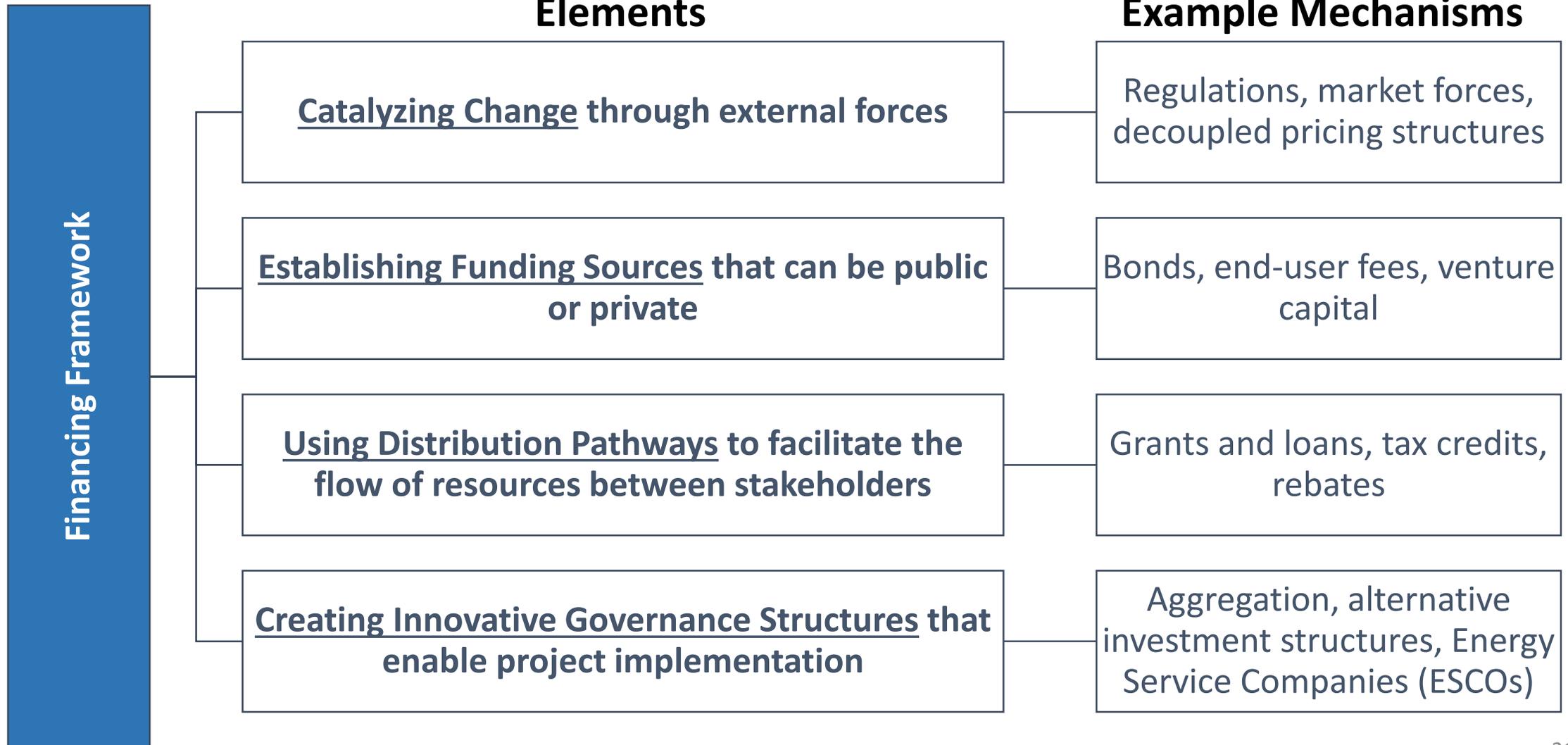


4. Creating Innovative Governance Structures

- Project and Financial Aggregation
- Green Banks
- Alternative Investment Structures
- End-to-end services
- Lease and Purchase
- Net Metering

Utilize a diverse financing strategy to minimize risk and increase economic potential

Financing Framework



Financing Stormwater- Living Map

Mechanisms Highlighted:

- Stormwater Fees
- Reverse Auction
- Performance-Based Rebates
- Stormwater Credit Trading Program
- Grant Programs
- Environmental Impact Bond
- Project Aggregation

stanford.maps.arcgis.com

Alternative Mechanisms to Finance Water Projects
Case Studies within the United States

Switch to builder mode

Reverse Auction (Cincinnati, OH)
Financial Mechanisms: reverse auction

The Low-Impact Development (LID) Trading program was established to prevent polluted runoff from entering the Shepherd Creek watershed. Landowners can either pay a fee (purchase an allowance) or install green infrastructure to capture stormwater in order to meet the runoff limit allowed by their property's permit.
[More Info](#)

Photo Credit: <http://www.cincinnati-parks.com/wp-content/uploads/2015/08/Washington1.jpg>

1 Green City, Clean Waters (Philadelphia, PA)
2 Green Bonds (San Francisco, CA)
3 Reverse Auction (Cincinnati, OH)
4 RainWise (Seattle, WA)
5 RiverSmart (Washington, DC)
6 CSO Management (Chicago, IL)
7 Rain to Recreation (Lenexa, KS)
8 Recharge Net Metering (Watsonville, CA)
9 Environment (Wa...)



Stormwater Retention Credits Trading Program
(Washington, D.C.)
Financing Mechanisms:
• Credit Trading
• Direct Regulations



D.C. Storm Water Retention Credit Trading

- Direct Regulation
- Credit Trading platform

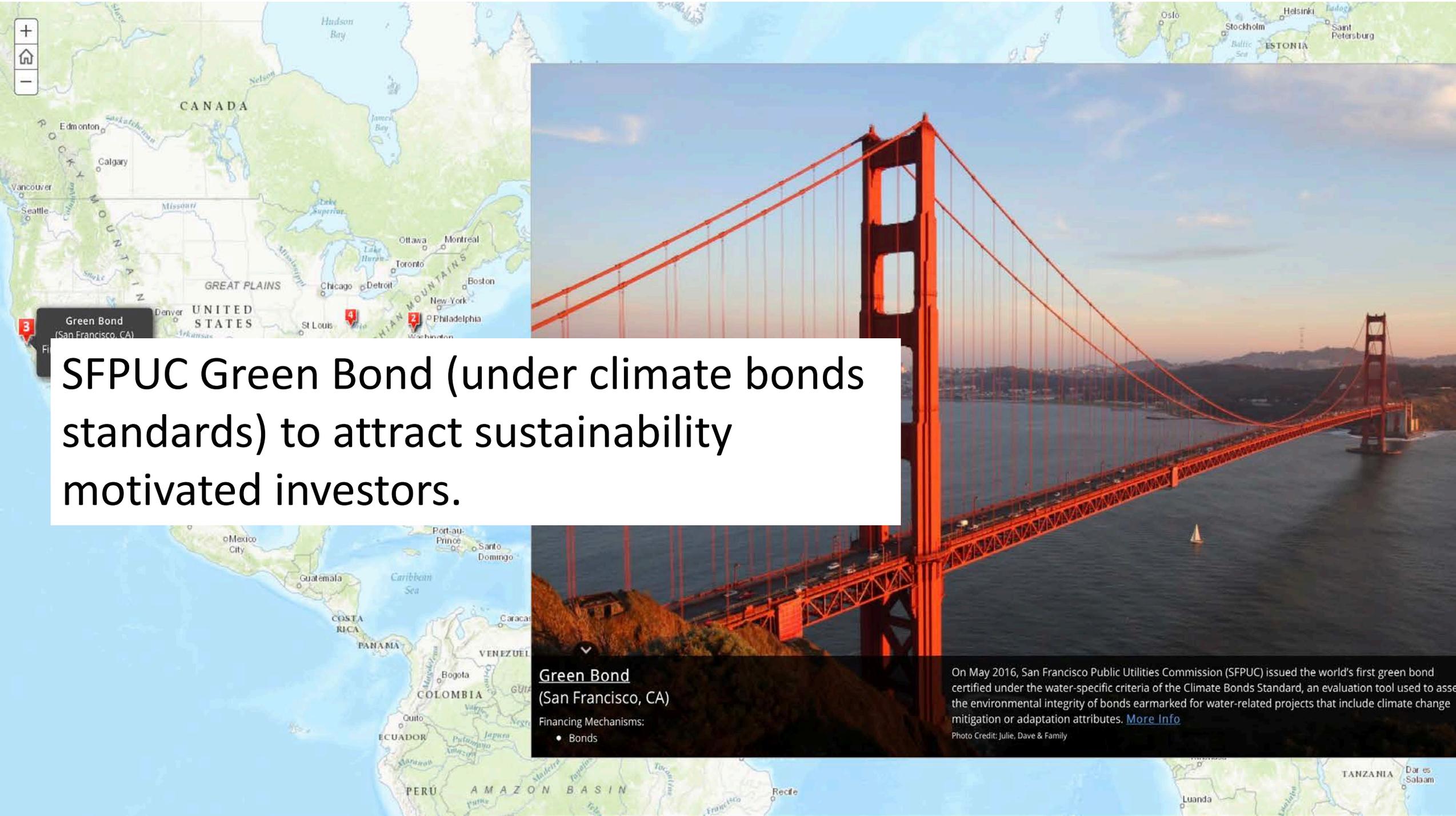


Stormwater Retention Credits Trading Program
(Washington, D.C.)
Financing Mechanisms:
• Credit Trading
• Direct Regulations

The District of Columbia Department of Energy & Environment (DOEE) recently implemented a Stormwater Retention Credit (SRC) Trading Program to encourage property owners to capture stormwater runoff and prevent pollutants from spilling into the Chesapeake Bay and the District's local waterways. The SRC Trading Program enables properties that voluntarily install green infrastructure to generate credits that can be sold in an open market and be used to meet regulatory requirements for managing stormwater runoff. [More Info](#)

Photo Credit: Wally Gobetz





SFPUC Green Bond (under climate bonds standards) to attract sustainability motivated investors.

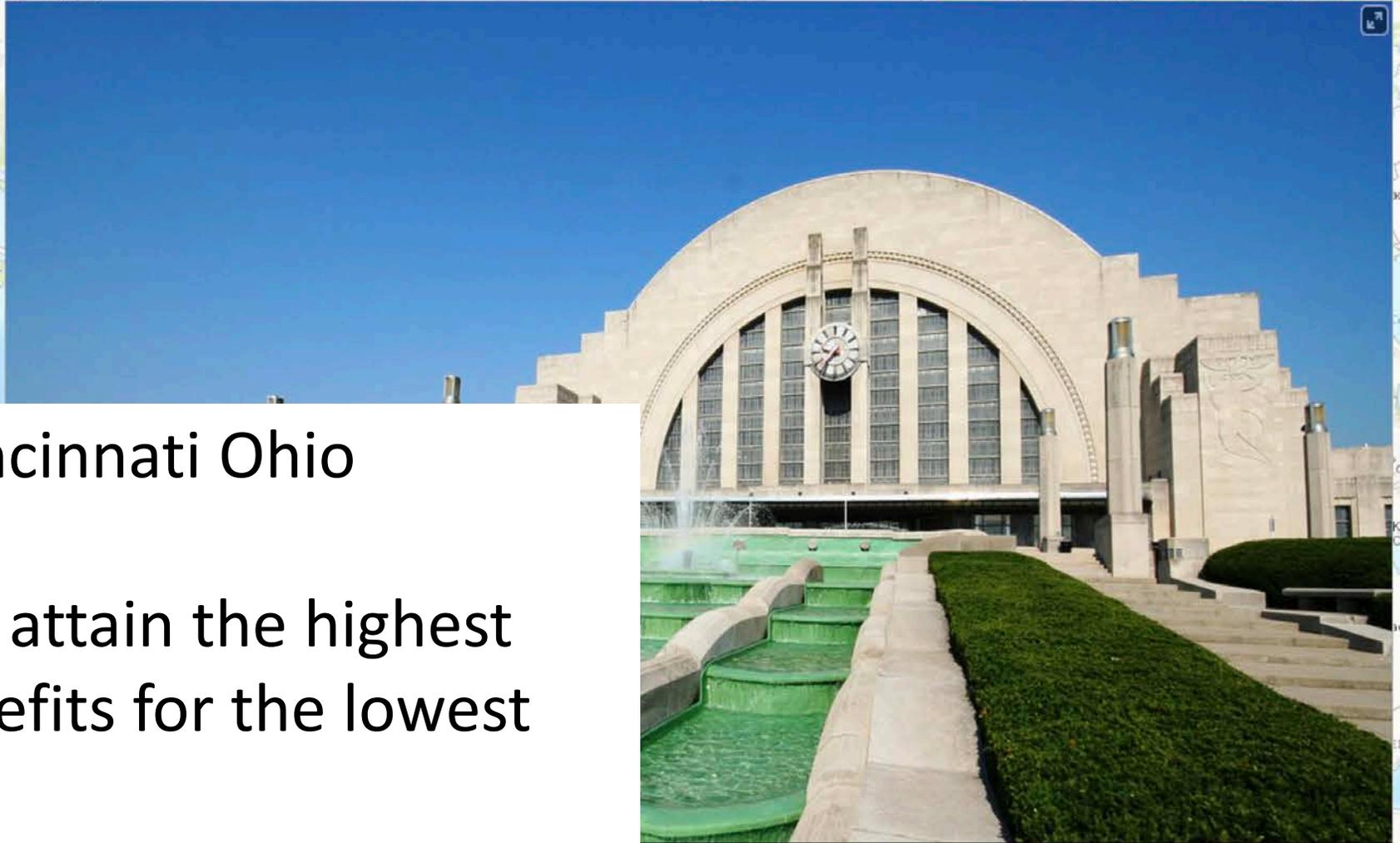
Green Bond
(San Francisco, CA)

Green Bond
(San Francisco, CA)

Financing Mechanisms:
• Bonds

On May 2016, San Francisco Public Utilities Commission (SFPUC) issued the world's first green bond certified under the water-specific criteria of the Climate Bonds Standard, an evaluation tool used to assess the environmental integrity of bonds earmarked for water-related projects that include climate change mitigation or adaptation attributes. [More Info](#)

Photo Credit: Julie, Dave & Family



Reverse Auction in Cincinnati Ohio

- Direct Regulation
- Reverse Auction-to attain the highest environmental benefits for the lowest price

Financing Mechanisms:
• Reverse Auction
• Direct Regulations

In an effort to develop a cost-effective stormwater management plan, a two-year reverse auction pilot program was implemented in Shepherd Creek using parcel-level runoff mitigation practices. Residents submitted sealed bids stating how much they would be willing to be paid to have free rain barrels and/or rain gardens installed on their property. Bids with the highest environmental benefits and lowest cost to the program were selected. [More Info](#)

Photo Credit: OZinOH



Food for Thought

- Enact policies and economic forces to drive change
 - Portfolio standards, demand-side management and pricing
- Establish more innovative funding solution
 - Green banks, impact investment, on-bill financing and net-metering
- Utilize a diverse financing strategy to minimize risk and increase economic potential
- Cost Sharing and customer-based financing can be an *enabler* at every scale
 - Developer, end-user, communities and municipalities

An aerial photograph of a city, likely Milan, showing a dense urban landscape. The central focus is a modern, dark-colored building with a striking vertical garden facade, where numerous balconies and terraces are filled with lush green plants and trees. This building stands out among traditional European-style buildings with red-tiled roofs. In the foreground, there's a park area with a green field and a playground. The background shows a vast expanse of the city under a clear sky.

Thank you
newsha@stanford.edu

Full Report:
<https://goo.gl/WIM3jA>

Research Brief:
<https://goo.gl/zy0g4h>