

Ready-to-Fund Resilience

TECHNICAL INPUT PAPER



U.S. Climate
Resilience Toolkit

Climate-Smart
Communities

Acknowledgements

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Feedback is essential for improving methods designed for deployment at a national level. Readers may send their thoughts or comments to ned.gardiner@noaa.gov.

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ADAPTATION PROFESSIONALS



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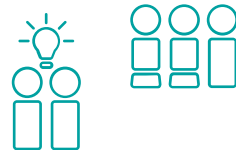
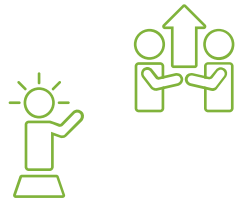
This paper provides the foundation for the Ready-to-Fund Resilience Online Toolkit. The toolkit is a self-guided resource to support local government practitioners and their technical assistance providers in:

- More effectively operating within the resilience funding and finance system.
- Better preparing themselves to receive funding and finance for climate resilience-building.
- Creating equity through resilience funding and finance.

[Access the toolkit here](#)

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Definitions of Key Terms

In this section are key definitions used within this Guidebook. Additional terms can be found in [Appendix E: Glossary of Key Terms](#).

Adaptation: The Intergovernmental Panel on Climate Change (IPCC) defines climate change adaptation as “the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.”¹

Adaptive capacity: Adaptive capacity is the ability of an individual, asset, or system to adjust to a hazard, take advantage of new opportunities, or cope with change. Adaptive capacity varies depending on the characteristics of the affected population, the nature of the changes, and the impacts of those changes.²

Bankable: Bankable projects are those possessing an attractive economic profile that appears likely to deliver high enough risk-adjusted returns to attract private sector equity or debt. In a bankable project, returns, costs, and risks are allocated appropriately between the government and private sector. Often, bankable projects refer to those that incorporate some form of revenue generation. However, projects can be made bankable through incentives. Also, by demonstrating how risks have been mitigated, there will be significant cost avoidance as well as additional (sometimes indirect) environmental, social, and/or economic benefits.

Community resilience: The Intergovernmental Panel on Climate Change defines climate change resilience as “capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identify and structure, while also mainlining the capacity of adaptation, learning and transformation.”¹ The Urban Sustainability Directors Network (USDN) uses a transformative definition of resilience: “the ability of people and their communities to anticipate, accommodate and positively adapt to or thrive amidst changing climate conditions and hazard events. Resilient communities enjoy a high quality of life, reliable systems, and economic vitality, and they conserve resources for present and future generations. The term resilience is often used interchangeably with emergency preparedness and response, but these elements only address part of this important concept.”³ It is essential to note that “community” can make it seem that an entire municipality is under this one descriptor when, in fact, we know that local governments (even small ones) are economically diverse and have diverse experiences.⁴

Equity (financial): In finance, equity is the value of assets minus financial commitments. For example, a homeowner’s equity equals the difference in the market value of the home and the amount outstanding on his/her mortgage.²

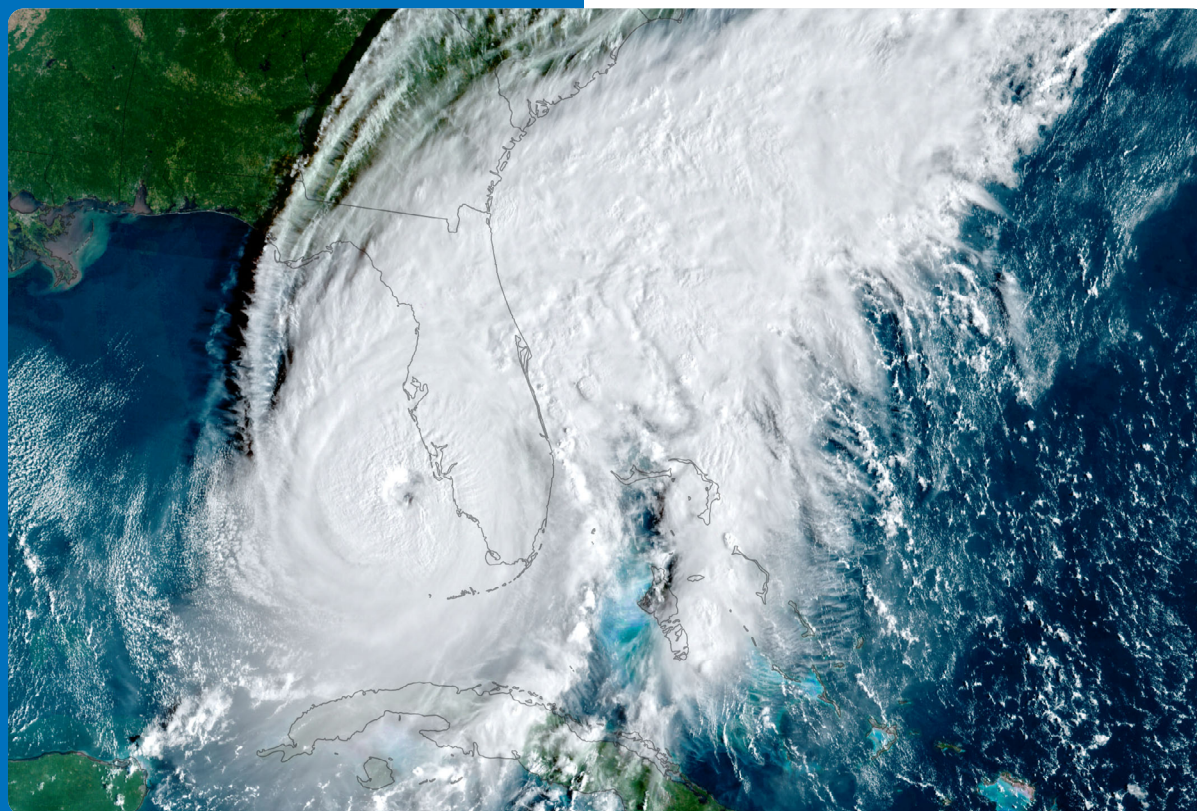
Equity (social): Equity in a social context is the fair and just inclusion in a society that allows all to participate and to prosper. Equitable responses to climate change address the unequal distribution of climate change impacts, accountability of who is responsible for causing and responding to climate change impacts, and the intersection of climate policy with other preexisting social and economic conditions. Ensuring equity in the context of funding and financing adaptation and resilience projects can include such considerations as the decision of how money is raised, how money is spent, and who should make these decisions.²

Funding: Funding in this guide is defined as money available on a one-time or limited time basis (e.g., a grant) or over time (e.g., taxes or fees) that does not need to be repaid.²

Financing: Financing in this guide is defined as money obtained for a project that must be repaid eventually (or obtained as financial equity investments). An example of a financing tool: a bank loan or revenue bond that typically is paid back over time with interest.²

Green infrastructure: Green infrastructure is defined by Environmental and Energy Study Institute (EESI) as “projects that combine gray infrastructure with nature-based solutions to create hybrid systems that improve resilience to climate impacts, while also often resulting in environmental, economic, and social co-benefits. Generally, green infrastructure is a built or engineered solution such as a green roof or bioswale.”

Natural infrastructure: While often developed in tandem, green infrastructure is distinct from natural infrastructure, defined by EESI as “projects that use existing or rebuilt natural landscapes (i.e., forests, floodplains, and wetlands) to increase resilience to climate impacts, often resulting in environmental, economic, and social co-benefits.⁵



Introduction

Photo: Hurricane Ian approaches the Florida coast. Simulated natural color image obtained from the GOES-16 satellite at 9:10 am on September 28, 2022. Credit: NOAA, NASA

Momentum is rising for climate resilience-building. This movement has risen by necessity. In 2020, the U.S. incurred 22 billion-dollar disasters, and that number likely will prove to have been repeated in 2021 when year-end disaster costs are established. Forecasts signal continually rising disaster costs, regardless of the scale of mitigation that occurs.⁶ Yet, the obligation to mitigate damage has triggered a movement to transform our spaces and, simultaneously, build more green, vibrant and equitable local governments. In essence, while the unavoidable costs may be the primary call for action, the transformational opportunities and myriad community benefits that we can create spark this work.

Still, a desire for change—even when accompanied by a robust plan and community alignment—often falls short of mobilizing action. Making the business case and securing climate resilience financing are the most common inhibiting factors.

This guide is written for and by local government resilience practitioners, referred to as “us.” Individually and as a group, we strive to increase climate resilience and create thriving, just, and equitable communities.

GUIDEBOOK GOALS

This guidebook applies to a variety of types of resilience projects, from “traditional” grey infrastructure to green infrastructure and social infrastructure. It supports local government practitioners to:

1. More effectively operate within the resilience funding and finance system.
2. Better prepare themselves to receive funding and finance for climate resilience-building.
3. Create equity through resilience funding and finance.

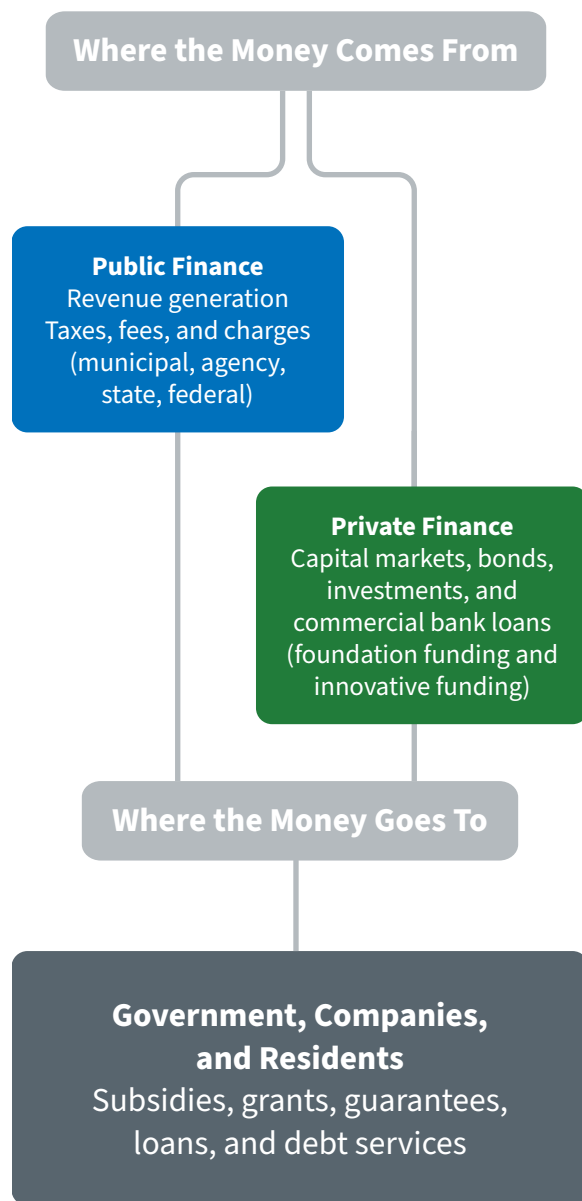
Ready-to-Fund Guidebook Goals

With the accelerating pace of climate change and the financing solutions, resilience projects, and professionals it has generated, this guide can help local governments save lives and improve livelihoods by delivering the physical and social infrastructure necessary for climate resilient communities.

Many resources are available that describe “what” to pursue in securing resilience funding and finance. They include federal, state and philanthropic grant opportunities or innovative financing mechanisms to leverage debt or capture future cost savings. These grants and mechanisms have created additional pools of money for resilience funding and finance. The November 2021 Infrastructure Investment and Jobs Act (IIJA) created the most recent significant pool.

However, a primary gap remains. While money may be available, local governments face many prerequisites to increase their eligibility for funds and capacity to obtain them. This guidebook seeks to change the focus from lists of resilience funding and finance resources to “how” local governments can design more fundable projects. Getting ready to fund resilience included pulling specific policy levers, seeking key partnerships, using innovative accounting practices, and rethinking and redesigning internal processes as well as inverting power structures.

Resilience is not an end state. It is a process of ongoing monitoring, shifting, and realignment. The guidebook is not intended to offer a roadmap to a singular endpoint. Rather, it offers guidance to support local government practitioners to develop flexible and dynamic partnerships, policies, processes, and practices that create a positive funding and finance environment to support climate resilience.



Funding and Finance 101

Local government is part of a financial system with public and private monies flowing in to support government projects. The money flowing into cities is both public and private, and both public funding and private finance are necessary for local governments to meet their climate resilience needs. Public funds come from revenue generation, including from municipal, agency, state and federal government taxes, fees and charges. Private funds come from the capital markets, including investments in bonds, bank loans and even direct equity investments. Philanthropic funding is also part of private financing.

Local governments use these public and private funds for subsidies, grants, guarantees and loans. Generally, in the context of local government financial dealings, funding is understood to mean money that does not need to be repaid, like a grant, while finance is understood to generally mean money that must be repaid, like a loan or debt service on a municipal bond (though sometimes it may also include financial equity investments).

Most municipal governments rely on bonds to finance their infrastructure investments. Bonds are either general obligation, meaning they are serviced by taxes, or revenue, meaning they are serviced by a tax or fee. Green bonds are a type of revenue bond that is mentioned in this guide. When a project has revenue associated with it, it is considered “bankable,” meaning that investors may be interested in providing capital to the project.

Figure 1: Where the money comes and goes. Adapted with permission from Climate Resilience Consulting (CRC).

Government bonds are generally rated by one of the credit rating agencies—such as Standard and Poors, Moody’s, or Fitch. This credit rating indicates the agency’s assessment of the ability of the issuing agency to pay back the debt. Increasingly, credit rating agencies are examining the physical risks of climate change in their assessments.

Finance and accounting professionals in local government are fundamental to the success of resilience finance including because they lead interactions with the rating agencies and co-create annual economic planning documents, like the capital improvement plan (CIP) or capital investment plan, a planning and fiscal management tool used to coordinate the location, timing and financing of capital improvements over a multi-year period.

There are signs that investors across the public and private sectors are keen on climate resilience investment. **Finance for adaptation increased by 53%—reaching USD 46 billion globally—in 2019/2020 compared to 2017/2018.** However, in the U.S. and Canada, funding specifically for adaptation decreased by 98 percent between 2019 and 2020 and funding for dual uses (adaptation and mitigation) projects decreased by 82 percent.^{7*} Government was the sole funder of adaptation-specific projects in both years; dual uses projects benefitted from both public and private investment in 2019 and only public investment in 2020. In 2019, the Global Commission on Adaptation estimated that “a (U.S.) \$1.8 trillion investment in adaptation measures would bring a return of (U.S.) \$7.1 trillion in avoided costs and other benefits.” Hopefully, as we better understand and communicate the immense value in climate resilience investment, and not only from a financial perspective but also in terms of the compounding

* Percentages were calculated using data provided by CPI’s Global Landscape of Climate Finance 2021.

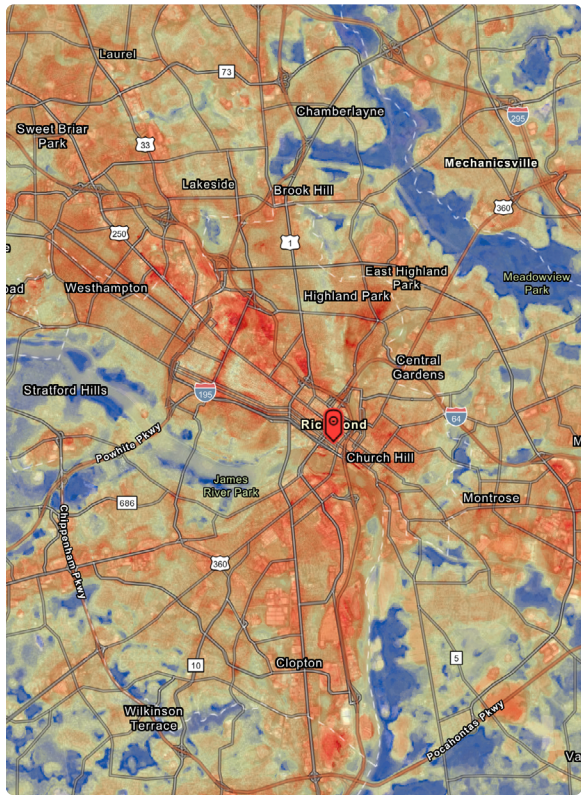


Figure 2: Urban heat islands (red) tend to coincide with historically redlined, economically-disadvantaged, and minority neighborhoods. Map of Richmond, VA courtesy of NIHHS CAPA Urban Heat Island [mapping campaign](#).

community benefits, many more opportunities will emerge to help fill the gap in resilience funding and finance.

Centering Equity in Resilience Funding and Finance

Climate resilience work is effective only if it embeds equity. Investments do not produce resilient systems if they bolster the well-being of one community while further exposing groups already at risk disproportionately to climate impacts. Accordingly, a secondary goal of this guidebook is to embed equity throughout all components of climate resilience funding and finance and to show its value through the 10 characteristics it presents.

Since the start of this decade, our country’s vulnerabilities have been illuminated and tested by the COVID-19 pandemic that triggered multiple crises for local governments. Yet, underneath the discrepancies in our health care, economic, social, and infra-structural systems, another layer becomes ever-apparent: rampant and deep-rooted inequities. As we peel back the layers of these disparities and inequities, one of the underlying causes looms large—centuries of systemic racism. As we seek to undo racist systems and be anti-racist, we also have an opportunity to envision a transformed social and economic system.

In the context of private and public funding and finance, wealth often generates more wealth. Reactive disaster management funds often repay communities for the wealth they possessed. This serves to perpetuate socioeconomic disparities.

Lower-to-middle-income and Black, Indigenous, and People of Color (BIPOC) communities—often residing at the front lines of climate change—are often viewed as lesser priorities for climate resilience investment.

What we do with climate resilience-building funds and financing resources will prove highly influential in determining what kind of communities we live in five, ten, or even 50 years from now. It is time to make the case and fight for creating vibrant, equitable and resilient local governments over temporary ‘fixes’ that perpetuate the status quo.

Acknowledgement

Municipalities confront numerous systemic barriers to centering equity and securing sufficient funding and finance for climate resilience investment. For instance, targeting resources to frontline communities may prove to be prohibitive politically. Funding applications may require design, planning or code elements a local government does not possess the resources to acquire. And immediate and pressing community needs may take priority for limited government resources. Likewise, climate resilience projects interweave inextricably with local contexts.

Therefore, funding them is not a standardized one-size-fits-all approach. As such, this guidebook cannot provide the full range of insight needed for local governments to succeed in funding transformative climate resilience projects. However, this guidebook employs today’s promising practices guided by expert advisors along with a comprehensive literature review; and field trends to establish a set of general guidelines adaptable to site-specific contexts. It will help local government leads and partners operate within current finance and policy systems to better prepare themselves and their communities for climate resilience funding and finance.

Guidebook Organization

This Guidebook defines **10 characteristics** of finance-ready plans and projects; these characteristics are referred to throughout this guide (Figure 3, here and on [page 24](#)).

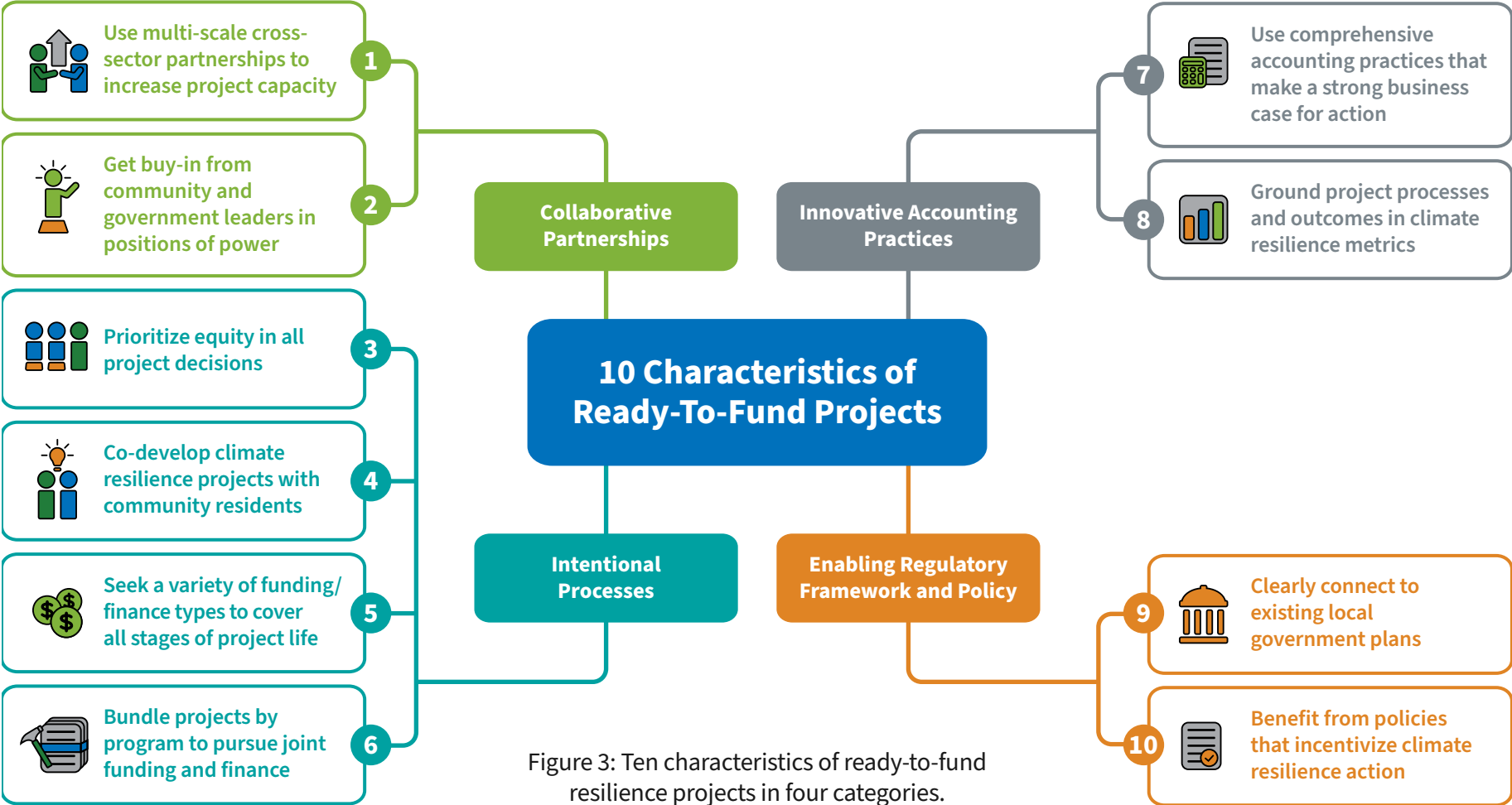


Figure 3: Ten characteristics of ready-to-fund resilience projects in four categories.

This Ready-to-Fund Resilience Guidebook also classifies characteristics in six sections:

| | | | | | |
|--|--|---|--|--|--|
| 1 WHAT The ready-to-fund characteristic in action. | 2 WHY How the ready-to-fund characteristic enhances municipal fundability. | 3 HOW Guidance on how local government practitioners can apply various practices to better resemble the characteristic of interest. | 4 RESOURCES Partners and guiding questions: Key partnerships involved in each characteristic, and related ready-to-fund resources. | 5 SAMPLE ACTIONS An illustrative actions checklist. Many checkboxes have been intentionally left empty so that you can fill them in in the context of your city. | 6 EXAMPLE Illustrative case study highlighting best practice and innovation. |
|--|--|---|--|--|--|

The intent is for you to be able to pick and choose which opportunities resonate most with your work or align most with the barriers you face day to day. [Table 2](#) on page 21 can be used as a tool to help identify where to start and focus your attention.

Guidebook Audience:

- Small- and mid-sized local government practitioners working on resilience.
- Small- and mid-sized local government department leads with power over, and a stake in, climate resilience funding and finance.
- Organizations and government bodies with the capacity and jurisdiction to support local government climate resilience funding and finance through policy, resources, technical assistance, partnerships, and process change.



Fundamentals

Photo: Employees at a solar power plant. Credit: VAKS-Stock Agency

Federal Momentum Around Equitable Climate Resilience

The federal government plays many key roles in the growth of climate resilience, including the provision of laws and executive orders; technical assistance on climate projections; providing grants to assess the vulnerability of infrastructure, such as highways and public transportation systems; and responsibility for the resilience of federal assets etc. Federal grants, loans, loan guarantees, and other federally backed resources such as mortgage insurance and flood insurance help finance and protect critical investments. Federal regulations and guidance set minimum requirements and provide information to guide government decision-making and use of federal dollars. And federally generated data inform project planning and execution.

Of late, several executive orders bring new momentum to support equitable climate resilience funding and finance at the local level:

- The Biden Administration’s [‘30 by 30’ U.S. lands and oceans climate goal](#) may offer opportunities to fund state resilience efforts. As part of the goal, The Administration would work with “state, local, tribal, and territorial governments, agricultural and forest landowners, fishermen, and other key stakeholders” to protect 30 % of U.S. lands and ocean territories by 2030.
- The Biden Administration’s January 2021 EO on [Tackling the Climate Crisis at Home and Abroad](#) establishes a whole-of-government approach to addressing the climate crises. While mitigation-focused, the EO also has a commitment

to delivering environmental justice in communities all across America and emphasizes assessment, disclosure and mitigation of climate-related risks in every sector of the economy. The EO also creates an environmental justice council and orders directed federal departments and agencies to look for ways to address social equity.

- The Biden Administration also has a focus on distributing federal resources for social equity benefits in the EO Advancing Racial Equity and Support for Underserved Communities, which prioritizes a “comprehensive approach to advancing equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality” in federal government programs, delivering 40 percent of climate investment benefits to disadvantaged communities, referred to as [Justice40](#). As this text was going to press, the Biden Administration released the [climate adaptation and resilience plans](#) for more than 20 federal agencies as well as a commitment to [improving the accessibility of climate information and decision tools](#) to individuals and communities facing intensifying climate impacts.

Federal Resilience Funding and Finance

As high-cost disasters erupt in more places, political and social will grows to address them. The Infrastructure Investment and Jobs Act (IIJA) of November 2021 serves as a pivotal moment in local government resilience finance. It encompasses resiliency and will be implemented by departments with climate action plans. It will lift new non-recovery funds to a level unavailable in half a century to the infrastructure sector whose ill-repair contributes to a lack of climate resilience. IIJA allocates funding in these categories ([Table 1](#), next page).

| TABLE 1: IIJA FUNDING ALLOCATION | |
|----------------------------------|---------------|
| Category | Funding |
| Transportation | \$284 billion |
| Water | \$55 billion |
| Broadband | \$65 billion |
| Energy and Power | \$73 billion |
| Environmental remediation | \$21 billion |
| Western water infrastructure | \$8.3 billion |
| Resiliency | \$47 billion |

Table 1: Approximate funding allocation specified by the November 2021 Infrastructure Investment and Jobs Act (IIJA).

Although just one of many funding areas, monies for climate resilience in this infrastructure law are not limited to the resiliency category. If invested intentionally, many dollars across other funding areas can contribute to building community resilience.

However, there is not guarantee that other funding will be used towards projects with climate resilience outcomes. Therefore, it is safe to assume that the funding available through IIJA is inadequate to support actions required to prepare and adapt to projected future climate changes—even if it extends beyond the roughly \$6 billion a year earmarked for resilience (\$47 billion over five years). The U.S. Environmental Protection Agency’s Climate Change Impacts and Risk Analysis (CIRA) project estimates average annual adaptation costs through 2100 associated with coastal protection, urban drainage, and roads, bridges and rail to be \$13–46 billion. Thus, the bill’s funding could cover less than half of the lower end of this partial estimate of national adaptation costs.

Increasingly, investors across the public and private sectors are keen on resilience investment. In 2019, the Global Commission on Adaptation estimated that “a (U.S.) \$1.8 trillion investment in adaptation measures would bring a return of (U.S.) \$7.1 trillion in avoided costs and other benefits.” As we better understand and communicate the immense value in climate resilience investment, and not only from a financial perspective but also in terms of the compounding community benefits, many more opportunities will emerge to help fill the gap in resilience funding and finance.

Private Sector Resilience Funding and Finance

The financing gap for resilient infrastructure largely reflects poor policies, institutional failures, and lack of investor familiarity with climate resilience investment mechanics

and longer-term project outcomes. Because infrastructure has strong public-good characteristics, it typically requires large-scale capital mobilization and is highly sensitive to local politics. However, the scale of infrastructure spending required over the next 15 years, coupled with widespread public-sector fiscal constraints, will make private finance increasingly important to address the climate resilience funding gap.

A need and an opportunity exist to strengthen the enabling environment for both public and private funding and finance. The ten characteristics in this guidebook outline what a positive enabling environment looks like as well as action opportunities that will lead climate resilience funding and finance strategies to the next level of fundability.

Barriers to Resilience Funding and Finance

Federal and private sector climate resilience funding and finance trends set the tone for climate resilience's financing landscape. But, understanding the barriers to securing funding and finance at a more granular level proves key to working more effectively within these macro-level conditions and identifying key actions.

For local governments, major barriers to resilience funding include competition for scarce resources; lack of political will to allocate resources to projects that accrue benefits beyond a mayoral cycle; leadership's resistance to transformative change that increases social equity; the absence of a resilience leader agency within a local government; differing timeframes and visions between municipal government and communities; the inability of a municipal government to hear and act on community needs; outdated cost benefit analysis methods, and a dearth of funds for the

convening, planning and design often required to initiate funding or financing. This guide addresses these barriers.

In this section, we address a related set of barriers: Issues in the market that may make it more challenging for local governments to fund or finance their resilience project.

Despite the pressing need to crowd in capital and recent growth in funding and finance opportunities, many communities—particularly small and medium-sized ones—have a difficult time securing private investment for equitable climate resilience. These challenges center on four main areas:

- **Economic:** Relating to project accounting and bankability.
- **Capacity:** Relating to the ability to meet the demands required of systemic transitions.
- **Cultural:** Relating to internal processes, partnerships, and communications.
- **Regulatory:** Relating to the planning and policy environment at a local, regional, and national

Table 2 ([following page](#)): Barriers to Resilience Funding and Finance and Guidebook Opportunity Mapping.

TABLE 2: ECONOMIC BARRIERS

TABLE 2: CAPACITY BARRIERS

| Difficulty making the business case | Scale and timeframe of resilience funding and finance requirements | Lack of Capacity | Project Complexity |
|---|--|--|---|
| <ul style="list-style-type: none"> • A lack of clear understanding and/or quantification of the myriad benefits that can accrue years after project completion, both directly in the form of revenue or indirectly in the resultant economic activity, environmental and quality of life improvements. • Guidance is limited about how to account in monetary terms for potential social and environmental benefits produced by adaptation and resilience projects. • Challenges to monetizing more holistic social and environmental project benefits plus uncertainty about when they will be realized and valued can skewer calculating cost-benefit assessments that prioritize wealthier communities over those historically disadvantaged. LMI and BIPOC communities often have the most to gain in terms of social and environmental co-benefits of climate resilience projects, yet these considerations often are omitted from project prioritization considerations. • Some resilience projects don't have a direct revenue source. Unlike renewable power that generates energy that can be sold, a flood mitigation project does not have a revenue stream. Investors consider projects without revenue associated with them as "unbankable." <p>Guidebook characteristics that address this barrier:</p> <p>7 8</p> | <ul style="list-style-type: none"> • Benefits from adaptation and resilience projects may be unrealized for years following project completion and they may hinge on nuanced concepts such as avoided costs or unrealized damages that can prove a challenge to communicate so the public understands. • The precision required to identify anticipated benefits and the need to determine specific beneficiaries makes assigning payment responsibilities difficult for adaptation and resilience projects that use traditional revenue-generating tools. • Since adaptation and resilience projects may require large upfront expenditures, debt financing often is needed. • To create debt financing, project proponents must identify and commit to securing a dependable revenue source that will repay investors over a longer time period. • For communities, the bigger issue than access to financing sources is the shortage of funding to pay back financing. <p>Guidebook characteristics that address this barrier:</p> <p>5 7 8</p> | <ul style="list-style-type: none"> • When local governments must contend with limited budgets, conflicting policies, and limited capacity, it can be difficult to meet resource and technical capacity requirements for securing funding and finance for equitable climate resilience. This can be even more pronounced for small and mid-sized cities with fewer resources. • Adaptation and resilience projects may be large in scale and designed to provide myriad benefits. Larger projects may require tapping into different funding sources to be realized. • Procedural and administrative requirements outlined in both state and federal funding sources can make it difficult to combine funding streams. <p>Guidebook characteristics that address this barrier:</p> <p>1 2 6</p> | <ul style="list-style-type: none"> • Planning for adaptation and resilience projects requires significant effort so more upfront resources may be needed for coordination and community engagement and complex design, engineering, and economic considerations.. • Local governments already operate with constrained resources and limited capacity to assume additional responsibilities so limited capacity can affect the ability to pursue and secure funding and deploy monies for adaptation and resilience projects. • Even if grant funding is available, some agencies don't have the capacity to onboard grant funds and administer or spend the money effectively. • Sometimes, grant administration rules are so onerous that jurisdictions don't apply. • No funding exists for planning a project. • Many debt service tools, such as taxes, require administrative resources to generate broad public support to meet voter approval thresholds. <p>Guidebook characteristics that address this barrier:</p> <p>1 2 6</p> |

CAPACITY BARRIERS (cont.)

TABLE 2: CULTURAL BARRIERS

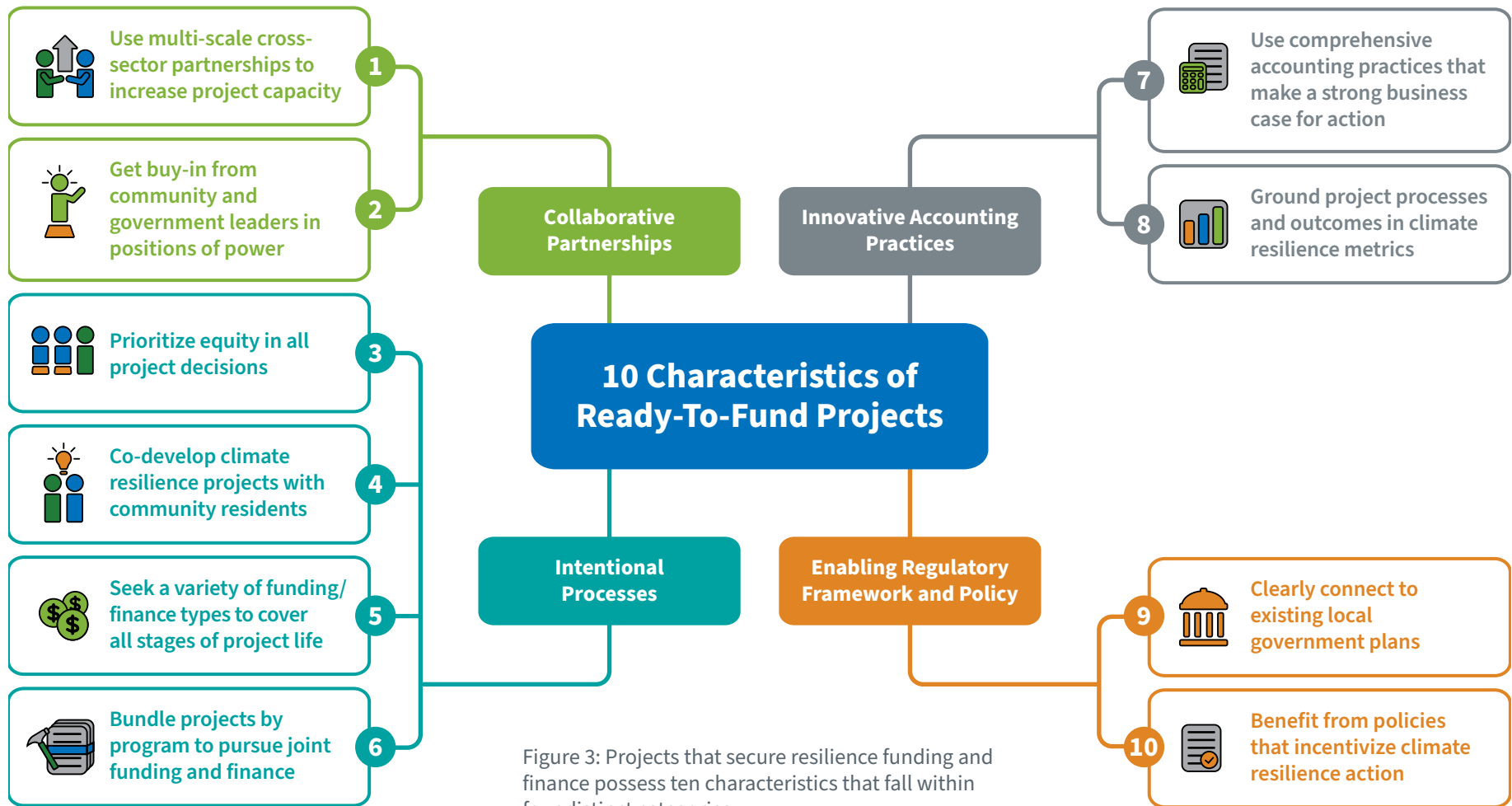
| Competing priorities | Novelty and transaction costs | Siloed approach | Misalignment |
|--|--|---|---|
| <ul style="list-style-type: none"> • Planning for adaptation and resilience projects is challenging because at the programmatic and project level, communities can face conflicting guidance about what needs to be done. For instance, a state may advocate that coastal communities consider sea-level rise in their decisions while also asking to increase their housing stock. • Coastal communities face significant housing shortages, so development opportunities can fall in low-lying areas at risk from sea-level rises. Western fires underscore the risks of living at the wildland urban interface. Redeveloping homes in the same locations could exacerbate climate-related risk. <p>Guidebook characteristics that address this barrier:</p> <p>1 7</p> | <ul style="list-style-type: none"> • Several newer and “innovative” finance tools, such as social impact bonds and insurance-linked securities, have emerged in funding and financing infrastructure for adaptation and resilience projects. These tools are largely unproven in the mainstream financing market. • Innovative financing mechanisms may be more difficult to use in the near-term since the presence or perception of transaction risk may exist because of a lack of performance and other data. <p>Guidebook characteristics that address this barrier:</p> <p>2 5 10</p> | <ul style="list-style-type: none"> • Often, the climate resilience agenda isn’t a priority or lacks the understanding of the importance of cross-agency involvement. • Compounding this lack of connectivity is little knowledge of, and capacity for, the resilience needed by finance and legal staff in particular and elected officials. • If a resilience agenda has no or low priority, it can prove difficult to persuade department and agency leads of the need for cross-sector/ cross-discipline resilience work. <p>Guidebook characteristics that address this barrier:</p> <p>1 2</p> | <ul style="list-style-type: none"> • When incentives and regulations misalign across local governments, investors can find it difficult to assess projects. • Creating financing structures and jurisdiction for each project increases transaction time and costs. Infrastructure experts estimate that the use of lawyers, engineers, and other advisers can equal one to five percent of project costs that prove difficult to recoup since they are not capitalized. • For resilient infrastructure projects, transaction and development costs may even be higher because limited data on financial and risk performance makes deal evaluation more complicated. <p>Guidebook characteristics that address this barrier:</p> <p>1 6 10</p> |

CULTURAL BARRIERS (cont.)

TABLE 2: REGULATORY BARRIERS

| Failure to center equity | Climate risk and resilience requirements are absent within policymaking/decision-making | Unfavorable and uncertain regulations and policy | Planning |
|--|--|--|---|
| <ul style="list-style-type: none"> Disadvantaged and vulnerable communities often face disproportionate impacts from a changing climate. Yet, they are deprioritized for climate resilience investment. These front-line communities with fewer resources will often possess limited capacity to pursue funding, secure financing, and deploy monies for adaptation and resilience projects. Existing institutionalized funding and financing practices could further increase disparities in community resilience if such practices do not change to explicitly remove inequity. <p>Guidebook characteristics that address this barrier:</p> <p>3 4</p> | <ul style="list-style-type: none"> Information about and measures to address risks from climate change are not incorporated into most policies governing public and private institutions. The absence of quantitative data on the financial and risk performance of resilience infrastructure projects exacerbates this problem which can incentivize risky behavior. Ahead, economic and financial realities will demand better accounting for climate risk in public and private sector policies and programs. <p>Guidebook characteristics that address this barrier:</p> <p>8 10</p> | <ul style="list-style-type: none"> Few regulatory incentives and policies exist to attract and secure private investors effectively. Climate risk is often absent or underemphasized in decision-making processes for investors. Because climate change is often perceived as slow-moving with impacts far into the future, climate risks are undervalued or not accounted for in many types of market investments Policy responses to climate change may lag investor actions <p>Guidebook characteristics that address this barrier:</p> <p>10</p> | <ul style="list-style-type: none"> Governments often fail to develop long-term plans, so infrastructure needs are unknown. Even with a long-term plan, the pipeline may not be well-communicated, resilient, or equity-centered. Infrastructure services in high climate risk areas may be deprioritized while community members continue to rely on them. When the number of projects is unclear, investors find it difficult to justify investing in diligence and credit evaluation expertise, or in partnerships. The project proposal and design processes often are decoupled from implementation as well as funding and finance considerations. <p>Guidebook characteristics that address this barrier:</p> <p>9</p> |

10 Characteristics of Ready-To-Fund Resilience



Collaborative Partnerships



Characteristic 1: Use multi-scale, cross-sector partnerships to increase project capacity

What.

Ready-to-Fund Resilience Projects leverage supportive partnerships to increase potential funding and finance available for projects.

Why.

Leveraging supportive partnerships can increase local governments' capacity to obtain climate resilience dollars. The following list of actions can increase this capacity as well as serve as their own outcomes of supportive partnerships:

- Facilitate community collaboration
- Identify, quantify, and actively mitigate risk
- Improve investor confidence
- Improve project bankability
- Increase efficiencies of scale
- Build and transfer knowledge
- Access new funds or pool existing funds
- Advocate for enabling policy and climate resilience funding criteria via partner coalitions

How.

1. Identify partners and capacity support

Internal Local Government Partners: Facilitate coordination between local government agencies and departments that are actively working to incorporate adaptation and resilience considerations. Larger cities may establish an institution to coordinate



cross-agency, resilience-related activities such as capital planning and resilience policies. However, this may not be possible in a small or mid-size community. If communities do not have the capacity to organize a formal coordinating body across agencies/ departments, they can start small and just organize regular meetings to build relationships and share ideas.

Community Partners: Leverage existing community partnerships and seek new relationships with community organizations working to advance sustainability, community resilience and adaptive capacity. Consider synergies in goals and anticipated outcomes. For instance, communities can adapt existing institutions with knowledge about community priorities, local barriers, and opportunities (e.g., other community advocacy groups and networks that can be partners) to create networks of community partners that can add to governments' capacities for resilience efforts.



Neighboring Jurisdictions (and State and National Government Entities): Regional collaborations spark many benefits. See [Characteristic 6: Bundle Projects by Program to Pursue Joint Funding and Finance](#) for insight into opportunities that can flow from collaboration with neighboring jurisdictions. Communities without existing institutions that have the formal and comprehensive capacity to focus efforts on resilience can especially benefit from regional collaborations. Such communities can explore opportunities to partner with neighboring jurisdictions that have such institutions, or even pool resources to create an inter-municipal resilience-focused group or institution. In certain cases, communities can check if state or federal entities may provide a forum for regional collaboration, or even capacity (such as technical assistance) for municipal collaborations.



SPOTLIGHT: REGIONAL ADVOCACY

An undervalued component of regional partnership is the creation of a coalition of voices to advance agendas at higher levels of government and create more enabling policies.³⁵ Together, local governments and partners can advocate that state and national government leaders do the following:

- Provide cover for local governments when facing administrative pushback and complexity in their pursuit of innovative resilience and equity-focused solutions.
- Embed equity language in their plans and legislation.
- Advocate for incentives that integrate climate resilience into day-to-day governance activities and prioritize low-to-moderate income (LMI) and black, indigenous, and people of color (BIPOC) communities.
- Establish enabling legislation for outcomes-based contracts and bonds.
- Identify key legislation to enable innovative financing mechanisms.
- Lobby to create a task force on an issue.
- Incorporate into law the ability of local governments to provide a stipend to community groups and members for community engagement.
- Shift procedural and administrative requirements to make it easier for local governments to combine funding streams for resilience projects.

Private Sector/ Funders: Leverage existing partners in the private sector and seek new relationships with community leaders. Consider synergies in organizational mission and sectors of action.

2. Identify areas where partners can offer additional capacity and support for climate resilience funding and finance.

[Table 3](#) offers opportunities for partnerships to support climate resilience funding and finance. For example, academic institutions could quantify risks and deliver resources and expertise to a government’s climate resilience work. The local business community could help quantify the multi-benefits to the community of climate resilience investment. Likewise, city departments, such as transportation, with access to significant resources could ensure that sector investments include climate resilience criteria and components (such as bike lanes and pedestrian paths, permeable pavement, curb bump outs, and other green infrastructure).

Within the report [Paying for Climate Adaptation in California](#), the Resources Legacy Fund offers guidance on potential partners and lead institutions to support climate resilience funding and finance, when to engage each, and primary opportunities that exist. An overview can be found in [Appendix D](#).



Table 3 ([following page](#)): Partnerships to support local government climate resilience funding and finance.

TABLE 3: PARTNERSHIPS TO SUPPORT LOCAL GOVERNMENT CLIMATE RESILIENCE

| Internal Local Government Partners | Community Partners | Neighboring Jurisdictions; State/ National Government Entities | Private Sector/Funders |
|--|--|---|---|
| <p>Who: Departments with mandates or missions that may be related to climate resilience projects such as finance, legal, public works, housing, public utilities, parks and recreation, public health, social services, planning, transportation, and economic development.</p> <p>Nature of Partnership</p> <ul style="list-style-type: none"> • Pool funds from variety of funding sources. • Grow consensus around and demand for prioritizing climate resilience funding and finance. • Establish internal champions who can address resistance to and bottlenecks in the climate resilience project cycle (see Characteristic 2). • Facilitate embedding climate resilience into city plans (see Characteristic 9). <p>Benefits of Partnership</p> <ul style="list-style-type: none"> • Identifying and onboarding internal champions for climate resilience funding and finance. • Breaking down silos: Onboarding partners to the idea that climate resilience is not an isolated agenda but sector agnostic, community-wide, and inextricably intertwined with each municipal department and decision-making body. • Reducing costs by incorporating climate resilience elements into existing plans and projects. | <p>Who: Community-based and faith-based organizations, local and national businesses, resilience hubs*, academic institutions.</p> <p>Nature of Partnership</p> <ul style="list-style-type: none"> • Offer a “brain trust” of experts to help identify and quantify risks as well as deliver resources and expertise to a government’s climate resilience work. • Contribute to data-gathering and locally relevant climate research. • Provide insight into how to take advantage of commerce and industry trends. • Reach out to populations with a high sensitivity to climate hazards and undertake community-level projects. • Support project design. <p>Benefits of Partnership</p> <ul style="list-style-type: none"> • Growing a coalition of support around resilience that helps strengthen public support for both climate resilience and climate mitigation. • Bolster in-house capacity for climate resilience | <p>Who: Other towns, cities, counties, tribal governments, regional authorities, state governments, and Federal Departments.</p> <p>Nature of Partnership</p> <ul style="list-style-type: none"> • Exchange local know-how and understanding of innovative financing mechanisms. • Participate in regional systems that support coordination between geographies. • Contribute cost-sharing, and reduce the need for new project investment. • Ensure that the most appropriate jurisdiction is pursuing funding aligned with community priorities. • Support an intentional and holistic approach to climate migration and managed retreat by identifying safe regions for relocation and avoiding rebuilding in areas that will face continued destruction. • Direct technical assistance. <p>Benefits of Partnership</p> <ul style="list-style-type: none"> • Providing a sense of confidence to potential investors in terms of project scale and level of municipal involvement. • Cost effectiveness. • Knowledge-sharing. • Identifying or developing a coalition for advocacy of equitable local climate resilience funding and finance. • Avoiding risk transfer and maladaptation by considering impacts on a regional basis. | <p>Who: Corporations, project developers, financial institutions, private equity and venture capital firms, development banks, impact investment firms, philanthropies, and engineering firms</p> <p>Nature of Partnership</p> <ul style="list-style-type: none"> • Coordination, financing, throughout climate resilience project lifecycle. • Calculating resilience into project design and feasibility reporting. • Create project accountability structures that enhance the bankability of equitable resilience projects. • Strategize on cost share and other finance scenarios. • Assume first level of risk in the projects’ finances to inspire other investors to contribute. • Spread a project’s cost over a more extended period and free up public funds for investment in sectors in which private investment is impossible or otherwise inappropriate. • Direct technical assistance and guidance. Note that many funders, including federal departments, encourage cities to reach out directly from guidance and technical support. <p>Benefits of Partnership</p> <ul style="list-style-type: none"> • Strengthened ‘bankability’ of project pipelines: Based in part on experience from similar work with other local governments, private partners may be in a better position to consider revenue generating potential, provide financial expertise to projects, create applications that reduce transaction costs, and even focus on achieving scale in specific sectors.* • Increased attractiveness of a project for investment and greater alignment of the outcomes required by the local government and what the private sector can deliver. • More accurate life cycle costs • Identification of risks and appropriate mitigation strategies • Feasibility and fallback arrangements |

* <https://www.usdn.org/resilience-hubs.html>

READY-TO-FUND RESOURCES

Partners

Internal local government partners, community partners, and the private sector (see above for details).

Wondering where community residents fit into these partnerships? See [Characteristic 4](#) below for more insight into community co-development.

Questions

How do we identify and leverage partnerships to support municipal resilience leads' capacity to advance the community climate resilience agenda? How to de-silo a climate resilience project and show its connectivity with a variety of municipal priorities? What untapped wells of leadership and opportunity exist in the community and where do these individuals have synergies in terms of shared goals?

Resources

These are resources recommended by a federal focus group of leaders from EPA, HUD, FEMA, and NOAA convened in January 2022.

FEMA Building Resilient Infrastructure and Communities (BRIC) offers holistic planning support to cities via their [direct technical assistance](#) (DTA) program. FEMA will provide support for project or application-specific needs as well as community-wide resilience needs for up to 36 months.

NOAA Funding and Financing Coastal Resilience Training offers a webinar series to distinguish between basic funding and financing approaches, generate ideas for overcoming common challenges associated with financing resilience projects, and access resources to identify and support funding and finance approaches. Consider as well the accompanying [Quick References](#) for an overview of numerous funding and finance options.

The **FEMA CBA Toolkit** is an online calculator developed using FEMA-approved methodologies and tools to show the cost effectiveness of your projects. The accompanying [user guide](#) navigates the platform. More information is available in the [FEMA Report on Costs and Benefits of Natural Hazard Mitigation](#).

U.S. Department of Housing and Urban Development Community Resilience Toolkits offers assistance to communities in enhancing their resilience to climate-related natural hazard risks. Local governments can use the Toolkit to identify natural hazard risks and resilience actions that can be integrated into existing programs, such as planting trees in housing developments or modifying building codes, and consider

actions and funding opportunities that could be implemented in the future. The toolkit also offers non-HUD funding streams on page 30.

The Environmental Protection Agency (EPA) offers a [Creating Resilient Water Utilities \(CRWU\) initiative](#) that offers drinking water, wastewater, and stormwater (water sector) utilities practical tools, training, and technical assistance needed to increase resilience to climate change. While these resources are designed with utilities in mind, many tools and resources can apply to local government practitioners in their roles as well.

NOAA's [A Seat at the Table: Training for Whole-Community Climate Resilience Planning](#) offers a learning resource to help “coastal resilience planning practitioners incorporate the needs and perspectives of socially vulnerable populations into resilience planning using inclusive, community-driven processes.” The resource provides helpful checklists, visuals, and examples, and an overview of whole-community planning with resources for identifying and engaging socially vulnerable populations.

The Federal Department of Transportation has assembled a [project bundling database](#) for six state transportation departments and a county bridge renewal project. This resource offers guidance on the program bundling process that can trigger local level action opportunities and identify existing programs by state. It gathers information on project bundling including how, why, and by whom. The database was generated as part of the Federal Highway Administration's Every Day Count Five (EDC5) Project Bundling. It contains case studies, contracts, programs, references, and research. Case studies include 12 state transportation departments and some county projects. (More information about case studies at [Bridge Bundling Guidebook](#).)





Characteristic 1: Use multi-scale, cross-sector partnerships to increase project capacity

SAMPLE ACTIONS

Short Term

Identify potential partners in each of these areas: internal partners in local government, community partners, regional partners, and private sector partners.

Longer Term

Cultivate long-term partnerships.

Ongoing

Identify areas where partners can offer additional capacity and support for climate resilience funding and finance.

NOAA's [Guide to Assessing Green Infrastructure Costs and Benefits for Flood](#)

[Reduction](#) offers a six-step framework to inform planning-scale assessments and spark discussion about green infrastructure options to mitigate flooding and provide other watershed benefits. This guidance includes how to estimate associated costs and benefits over a chosen planning horizon and demonstrate cost effectiveness.

Example

In 2014, Prince George's County, Maryland, [needed to meet the requirements](#) of both EPA Clean Water regulations and the regional Chesapeake Bay Watershed Implementation Plan. This meant green infrastructure retrofits for 30% of untreated developed areas to be completed by 2017. To meet this challenge, the county entered into a Community-Based Public-Private Partnership with Corvias, an infrastructure and facilities management company. This newly created [Clean Water Partnership](#) (CWP) supplemented public stormwater fees with private financing options and private investment throughout the [project development and implementation phases](#). Crucially, the CWP agreement also included [co-benefits for local residents](#), as 50% of construction had to be subcontracted to local certified small, minority and women-owned businesses. Plus, at least 51% of man-hour/job participation had to be filled by county residents. Realizing a need for more local participation to meet construction and maintenance goals, CWP leaders instituted a variety of [educational](#) and [supportive services](#) programs to expand the capacity of local, small and minority firms in stormwater management and green infrastructure projects. By 2017, [CWP completed](#) and certified over 2,100 acres, using more than 85% small, minority and women-owned businesses in the county, and saved more than 40% compared to traditional budgets.

Collaborative Partnerships



Characteristic 2: Get buy-in from community and government leaders in positions of power

What.

Ready-to-Fund Resilience Projects get buy-in from community and government leaders in positions of power to increase resilience projects' level of priority in the local governments' portfolio and counter resistance to climate resilience action.

Why.

Obtaining buy-in from community and government leaders in positions of power can:

- Grow untapped support for resilience funding and finance.
- Counter pushback from individuals or departments with veto power that resist resilience investment.
- Ensure longevity of in-progress resilience projects beyond election cycles.
- Generate broader buy-in to increase investment opportunities.
- Align cross-sector departments and resources toward a common guiding vision to create project efficiencies and mutual benefits.
- Help to prioritize climate resilience projects within a competitive funding environment.
- Increase accountability for achieving resilience project impacts.





How.

1. Refine the value proposition of climate resilience.

Developing a clear and motivating narrative of what climate resilience means in your local government is critical to generate buy-in and to align cross-sector departments and resources toward a common guiding vision for the community. With strong community support, media attention, and community organizing, this refined resilience vision can improve the appeal of climate resilience work for people who may be resistant to it.

You will need to show that resilience is inextricably intertwined with stormwater, housing, public health, planning, economic development, etc. A component of this entails seeking to commit to a de-siloed approach to climate resilience and mitigation. For example, investing in natural or green infrastructure can further greenhouse gas mitigation goals as well as advance climate resilience agendas with benefits that complement hard or gray infrastructure systems, such as water and food security, public health and safety, and wildlife habitat. Also, weaving carbon emission goals into resilience plans can further support climate mitigation and adaptation agendas working together.

2. Identify people in power and develop strategic messaging to attract them

Consider who holds power over local resilience funding and finance and where untapped support for resilience funding and finance may exist. This could include local government leaders in finance, legal, public works, the town council, the mayor's office, or such community influencers as business leaders, philanthropists, impact investment firms, and economic development agencies.

MUNICIPAL CREDITWORTHINESS AND HIDDEN COSTS OF INACTION

Many credit rating agencies now account for climate resilience in their credit ratings for state and local governments.¹² A major natural disaster could shock local economies and increase stress on municipal operations, triggering decreased tax revenues and higher debt burdens. These outcomes could prompt a credit rating downgrade.¹²

The C40 Cities [Good Practice Guide on Creditworthiness](#) identifies a number of key areas in which to focus to enhance municipal creditworthiness,¹³ including development of a climate-smart, long-term capital investment plan and a pipeline of public infrastructure projects that seek to estimate:

- The service delivery issues for a municipality in the present and future.
- Priority projects to address these gaps.
- Project costs.
- How these projects should be sequenced and delivered over time.

Doing this can help attract potential investors. It reflects good governance and planning, particularly when greenhouse gas mitigation and climate resilience building are central to the plans. Local governments can improve creditworthiness and achieve the financial autonomy necessary to unlock available capital. They can charge users for infrastructure, improve collection of arrears, use technology to reduce the cost of revenue administration, and deploy new and innovative models of finance and investment. Many of these options align well with key resilience investment. Consider [Characteristic 9](#) for additional insight and resources for developing long term ‘climate smart’ CIP plans.

Identify common causes or multiple benefits that can generate support from champions across departments, agencies, businesses, nonprofits, and others to pool resources and share responsibilities. Determine how these players could address barriers around resilience funding and finance. Strategic messaging is essential to attracting these influencers and getting them to support obtaining climate resilience funding and finance. [Table 4](#) can be used to identify target audiences and respective strategic messages.

TABLE 4: TARGET AUDIENCES AND STRATEGIC MESSAGES

| Federal Funders | Private Funders (foundations, philanthropists, impact investors) | Local Government Leaders | Elected Officials |
|--|--|--|--|
| <p>Strategic Messages</p> <ul style="list-style-type: none"> • Quantifiable costs and benefits, reliable data, program and policy objectives, and logistical procedures. • Letters of support that demonstrate community buy-in. <p>Examples</p> <ul style="list-style-type: none"> • Compare costs and benefits of different actions to achieve a specific goal, and estimate the positive impacts on amenities that people value, such as health and clean air as well as increase safety and avoid damages and expenses. • Ask the business community or other key leaders to assist by preparing an economic study that frames the long-term scale of the problem. One such report is the Natural Hazard Mitigation Saves Report, updated in 2019, that indicates each dollar invested in mitigation saves between \$4 and \$11.⁸ A local version: Building-level adaptations in Miami Dade such as floodproofing, elevation, and the addition of permeable surfaces will generate \$9 for every \$1 invested and support 3,190 job years, which is one job per person each year, through 2040.⁹ | <p>Strategic Messages</p> <ul style="list-style-type: none"> • Impacts of climate change impacts on people and the environment, obligations to future generations, equitable outcomes, and environmental stewardship. <p>Examples</p> <ul style="list-style-type: none"> • Communicate how a project will benefit underserved communities; who will bear the cost and who will receive the benefits. • Organize site visits and present community input and levels of buy-in.¹⁰ • Encourage the business community to get involved by communicating the economic costs of inaction and, conversely, the multiple benefits of equitable resilience investment. | <p>Strategic Messages</p> <ul style="list-style-type: none"> • Highlight the interconnectivity between your different agendas and shared goals. Get them to see the connections. • Begin with trusted colleagues who can advocate for this work from within their own departments. • Appeal to the bottom line <p>Examples</p> <ul style="list-style-type: none"> • Point out that having more affordable housing in areas outside a floodplain will support a larger workforce that will contribute to the local government tax base. • Change the conversation around debt by showing the costs of inaction and credit implications. • Failing to take more action in the near term to bolster climate resilience could impact economic and financial indicators such as: loss of tax base, revenue loss downgrade in a municipal credit rating, decreased ability to pay debt, disclosures and valuation. | <p>Strategic Messages</p> <ul style="list-style-type: none"> • Demonstrate to elected officials the direct and indirect benefits to companies at the regional level—whether it’s reduced damage to assets, fewer business interruption, or enhanced economic activity—to foster buy-in. • Identify and engage beneficiaries who can support big projects. <p>Examples</p> <ul style="list-style-type: none"> • Tie in effective economic arguments targeting major regional players or potential funders. • Since many climate resilience projects build capacity rather than serve as ‘ribbon cutting’ enhancements, celebrate these less ‘visible’ achievements. This can help retain momentum and interest. “Ribbon-cutting” ceremonies for resilience initiatives can generate support and boost their importance. |

Table 4 (above): Target audiences and respective strategic messages.

Figure 4 (next page): Cross sector local government partners with a stake in ready-to-fund resilience funding and finance, by hazard. Screenshot provided by the World Bank Group.

Resources

The World Bank Group [Guide to Climate Change Adaptation in Cities](#) offers a sample of climate hazards and adaptive responses across sectors, a portion of which is shown in [Figure 4](#) (next page).¹¹ These tables can provide insight into cross-sector agencies impacted by various regional hazards, providing a foundation for building a cross-sectoral resilience agenda.

TABLE 6.1 SAMPLE OF CLIMATE HAZARDS AND ADAPTIVE RESPONSES ACROSS SECTORS

| Projected Change in Climate Phenomena (Likelihood) | Drivers of Urban Exposure and Vulnerability | Consequences for Cities, if Unaddressed | Sectors Involved | Sample Adaptive Responses (not an exhaustive list) | Relative Investment Level / Cost | |
|---|---|---|--|---|---|-----------------|
| Warmer with fewer cold days and nights, more hot days and nights (virtually certain) Hot spells/heat waves—increased frequency (very likely) | Urban heat island effect. Lack of electricity and cooling systems, especially in many informal settlements. | Exacerbated air pollution Heat-induced illness and death | Transportation, housing, private sector building industry, public health | Green infrastructure, including improved vegetation and green building investments for natural cooling. | Medium to high with significant economic and sustainable development cobenefits | |
| | | | | Retrofit of existing bus fleet with white roofs to reduce solar heat gain and ventilation to ensure adequate air circulation. | Low to medium | |
| | Undertaking public relations campaigns to encourage passengers to carry water with them to avoid heat stroke. | | | | | |
| | Lack of diversified energy supply and substandard energy infrastructure. | Energy shocks and disruptions because of increased demand | Energy | Investment in clean energy and energy efficiency. | Low to high, depending on the specific energy investment; significant cobenefits for economic prosperity and “green growth.” | |
| Heavy precipitation events—increased frequency (very likely) Intensity of tropical cyclone activity increases (likely) Rising sea level (virtually certain) <i>(continued next page)</i> | Rapid urban growth leading to informal settlements on marginal land with no roads or drainage systems, or drains that are clogged with debris and silt. | Exacerbated flooding and landslides | Land use, housing, solid waste, public health, emergency management | Development and enforcement of a sound land use plan that a) is based on understanding of climate change vulnerabilities, b) effectively encourages dense, mixed-use development in resilient areas, and c) engages ecological planning approaches outside of city limits (for example, village-level watershed management on the outskirts of a city, protection of mangroves and wetlands on nearby coastline). | High, involving significant political and staff investment | |
| | | | | Contaminated waters and spread of disease in stagnant waters | Improved solid waste handling practices (for example, proximity to drinking water supply, corrosive-resistant containers) to prevent leakage and contamination. | Medium to high. |
| | | | | Short-term clearance/disposal of solid waste from drains to prevent clogging. | Low | |
| | | | | Public health engagement and risk prevention around likely flood-related diseases. | Low | |
| | | Nonexistent or substandard transportation infrastructure. | Blockage of emergency routes because of road flooding, resulting in delayed emergency evacuations Losses in commercial activity | Transportation, emergency management, private sector | Investment in roads and other transportation choices for informal settlements. | Medium to high |
| | | | | Green infrastructure. | Medium to high with significant economic and sustainable development cobenefits | |
| | | | | Relocation of storage yards for buses and train cars out of flood-prone areas to reduce the risk of damage or loss of this equipment. | High | |

READY-TO-FUND RESOURCES

Partners

Business community leaders, neighborhood association presidents, faith-based leaders, large regional players (hospital system, transportation sector, major employers, affordable housing developers, etc.), and others who influence money flows and elections. Academic institutions and other firms that can complete quantitative modeling to support a strong narrative around resilience funding and finance.

Questions

Who holds significant decision-making power over resilience funding/finance? What are the opportunities to recruit them? Who in the community may be a leader and champion for resilience funding/finance? How can we convince skeptics of the resilience agenda's importance? How can we develop strategic messaging to refine the value proposition of resilience based on the audience we are appealing to? How are we defining resilience in our community?

The [Anthropocene Alliance](#) offers guides for community activism. Employing methods described in them, community members can demonstrate widespread support for local government resilience initiatives. Most importantly, coordinated community activism may help local initiatives gather wider support from influential bodies, such as certain universities, businesses, or elected officials at higher scales of government who initially may be resistant to resilience measures.

Example

The [Pittsburgh Mayor's Fund](#), OnePGH 501(c)(3), coordinates government, private and philanthropic capital to leverage additional value from public assets to benefit residents. The grand vision foresees a streamlined Pittsburgh, where government, nonprofits and corporations pool resources into a separate tax-exempt organization to fund \$3.5 billion in commitments by 2030. Since 2015, the city has assembled more than 2,000 residents to identify the city's profile for shocks and stresses as well as the most critical projects poised for implementation.

Since 2018, the Division of Sustainability and Resilience within the Department of City Planning has assembled more than 125 partners into working groups to identify such critical projects. The fund focuses on 10 areas: affordable housing, climate and environment, arts and culture, workforce development, early childhood, mobility, water delivery, stormwater, government performance and innovation, and critical communities. In lieu of taxes, local corporations and businesses (such as a major health care organization, for example) can provide monies to fund city



Characteristic 2: Get buy-in from community and government leaders in positions of power

SAMPLE ACTIONS

Short Term

Develop a clear and motivating narrative of what climate resilience means in your local government.

Identify people in power and develop strategic messaging to attract them.

Longer Term

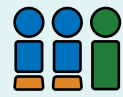
Cultivate long-term relationships with people in positions of power.

Ongoing

Consider who holds power over local resilience funding and finance and where untapped support for resilience funding and finance may exist.

projects that align with their organizational mission. For example, local hospitals can invest in community green infrastructure and tree-planting projects that enhance community health outcomes. By identifying community leaders in the public and private sectors and connecting their investment to a community problem that aligns with their values, the city effectively created a mechanism that fosters buy-in while growing the pool of resources available for climate resilience funding and finance.

Intentional Processes



Characteristic 3: Prioritize equity in all project decisions

What.

Ready-to-Fund Resilience Projects prioritize low- and moderate-income (LMI) and BIPOC communities for investment and embed equity throughout the decision-making process to benefit entire communities and economies.

Why.

Prioritizing equity in all project decisions can:

- Attract different funding sources, including philanthropic and federal programs with an aim to build equity.
- Decrease demand for, and the cost of, social safety nets.
- Enhance community trust.
- Create long-term community economic vitality by ensuring accountability to outcomes that reflect real community needs and assets rather than assumptions.

How.

1. Training and capacity building on equity

Ongoing and historical injustices increase the challenges certain communities must overcome to support adaptation measures and increase climate resilience. For example, limits on wealth-building such as restricted access to credit and homeownership decrease the perceived value in a community and can reduce access to traditional financing that favors high-value assets. Historical disinvestment increases existing



needs relating to rising deferred maintenance and the lack of sufficient and sustainable infrastructure. These affect public assets such as water, stormwater, transportation, health and schools. Historically, major federal investment in infrastructure, such as the interstate highway system, has disrupted and physically fragmented lower income and BIPOC communities.

Without a clear link to social equity, historic inequities are likely to perpetuate. Generally, communities with fewer resources will possess limited capacity to pursue funding, secure financing, and deploy monies to support adaptation and resilience projects. Existing institutionalized financial practices will only serve to further this negative feedback loop if such practices do not change to incorporate equity concerns. For example, credit rating agencies' downgrading of municipal bond ratings for communities with challenges in recovering from climate-related disasters will only raise borrowing costs for funds needed to recover economically in those communities.



Encourage planning agencies to recognize historic institutional racism that shapes dispossession of BIPOC communities and contributes to massive disparities in wealth.¹⁴ Ensure the entire project team across agency siloes undergoes equity, diversity, and inclusion training. It should reflect local contexts so leaders understand how institutional discriminatory practices have influenced local community disparities.

2. Prioritize LMI and BIPOC communities disproportionately at risk of climate impact for climate resilience investment

Adaptation strategy cannot succeed unless a commensurate set of activities and commitments to social equity exists to ensure that disproportionately at-risk populations

obtain the financial, technical, and institutional resources they require to adapt. When the needs of the marginalized are met, the entire community shares the benefits.

Work with key partners to establish criteria for equitable climate resilience so LMI and BIPOC communities can benefit. Likewise, seek legislation to require planning processes to adopt principles of procedural equity.

See [Characteristic 5](#) for how to center humans and equity within cost-benefit analyses.

3. Have a robust platform in place to shift power to communities via community co-development.

See [Characteristic 4](#) below for insight into community co-development.

4. Have long-term systems of evaluation in place

Efforts to include equity in decision-making tend to reflect a ‘one and done’ mentality as leaders think the hard work has been done after completing diversity, equity, and inclusion (DE&I) training or conducting a vulnerability assessment. While institutions must guard against implicit and explicit biases that can prevent equitable policymaking, centering equity is an iterative process that involves long-term transformational change.

Preventing the perpetuation of inequalities requires reevaluating projects to gauge and address inadequacies. Improvement encompasses follow-up and robust evaluation systems as well as greater connectivity, collaboration, and mutual support among communities and local decision-makers.



READY-TO-FUND RESOURCES

Partners

All levels of government, community-based organizations, business partners, state and national government, individuals who will be impacted by project outcomes, community organizations, community members, activists.

Questions

How can equity encompass how resilience projects are prioritized, how internal processes are handled, and how daily decisions are made? Has equity been embedded in every stage of the process—from project design through long-term monitoring? Key considerations include: how money should be raised and spent, and who should make decisions for each?

For insight into establishing a robust system for evaluation and long-term performance measurement, see [Characteristic 8](#).

Resources

[City of Seattle’s Racial Equity Toolkit](#) offers a process and set of questions to guide the development, execution and evaluation of policies, initiatives, programs, and budget issues to address the impacts on racial equity.

[Advancing Racial Equity and Transforming Government: A Resource Guide to Put Ideas into Action \(Government Alliance on Race & Equity\)](#) provides strategies to advance racial equity and government transformation using these strategies:

1. Employing a racial equity framework.
2. Building organizational capacity.
3. Applying racial equity tools.
4. Integrating data.
5. Partnering with other institutions and communities.
6. Communicating.

The guidebook contains best practices on capacity-building (pages 23 and 24), including for Fairfax County, Virginia, for instance.

[Racial Equity Toolkit: An Opportunity to Operationalize Equity \(Government Alliance on Race & Equity\)](#) delivers guidance on aligning everyday decision-making with organizational racial equity goals and desired outcomes. This enables equity to be incorporated throughout all phases, from development to execution and evaluation. The tool seeks to support local government leaders by:

- Seeking proactively to eliminate racial inequities and advance equity.
- Identifying clear goals, objectives and measurable outcomes.
- Engaging the community in decision-making processes.
- Identifying who will benefit or be burdened by a decision; examining potential unintended consequences of a decision; and developing strategies to advance racial equity and mitigate unintended negative consequences.
- Generating mechanisms for successful execution and evaluation of impact.

Table 5: Six areas to centering equity in climate resilience funding and finance



TABLE 5: SIX AREAS CENTERING EQUITY

Project criteria and incentives to give LMI and BIPOC communities priority.

Establishment of a system for follow-up and evaluation after a project’s completion with measures of project success determined by community-defined needs and benefits.

Integrating more holistic social and environmental project components into cost-benefit analyses. This places a higher value on the elements that define one’s well-being day to day. (See [Characteristic 8](#) for additional detail).

Ground decision-making in the understanding and acknowledgment of historical inequity and systems of oppression.

Leadership by community residents in prioritizing projects and their design, execution, and ongoing evaluation; measures in place to ensure accessibility.

Proactive community relationship building, connectivity and collaboration.

The UK Climate Impacts Programme (UKCIP) offers a range of tools and resources, including a database of case studies, on adaptation to climate change. In particular, [LCLIP \(Local Climate Impacts Profile\)](#) is a resource that local authorities can use to understand exposure to weather and climate in more detail. Another UKCIP tool is the [Adaptation Wizard](#), which takes users (not specifically local governments) through a process to determine vulnerability to climate change, identify key climate risks, and develop a climate change adaptation strategy.

Diversity, equity, and inclusion training resources

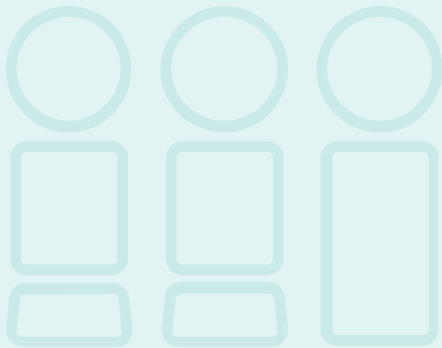
[USDN Equity Foundations Training](#) is a tool to incorporate a racial equity perspective into sustainability. It provides themes on promoting racial equity, communicating about equality, building a common knowledge of equity, applying an equity lens in your business, and forming racial equity teams. The videos, worksheets, and facilitator's guide for equity enables leaders to offer workshops.

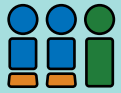
[Purdue University's Understanding Diversity and Inclusion](#) course offers opportunities to build cultural diversity skills and knowledge for creating inclusive environments.

The [Inclusion of Minorities in Community Development](#) training discusses the conceptual foundations of diversity, challenges relating to effective inclusion, successful organizational change methods, and the tools and approaches that can help achieve inclusivity in community development initiatives.

Example

In response to community concerns about the effects of climate change, the City Council of Hampton, Virginia, included community stakeholders, city staff, and





Characteristic 3: Prioritize equity in all project decisions.

SAMPLE ACTIONS

Short Term

Require local government leaders across departments to take DE&I training.

Longer Term

Develop a framework and investment criteria that gives priority for climate resilience investment to LMI and BIPOC communities at risk disproportionately from climate change's impacts.

Ground decisions in an understanding and acknowledgment of historical inequity and systems of oppression.

Ongoing

Build long-term relationships with community organizations and residents.

Ensure measures of a project's success determined by community-defined needs and benefits.

consultants when establishing the [Hampton Comprehensive Waterways Management Steering Committee](#) in 2010. This committee began a decade of engagement to identify the most effective solutions for meeting local needs while developing residents' trust and buy-in, represented by the success of projects the past five years. [Phase I](#) of these solutions started with an 18-month research and planning process that included four public workshops that examined citizen observations, concerns, and proposed solutions. The workshops sparked the analysis and strategies for a citywide plan for resilience. Among its solutions are several ways to include community voices on project design, execution, and maintenance. Ideas from Phase I as well as ongoing community input have helped in designing [Phase II](#), a pilot process for a watershed project. In this phase, the city has alternated hosting technical design workshops with setting up community meetings that allow residents to help technical experts define new ideas and to provide feedback on materials generated in the design process. This has included selecting the Newmarket Creek watershed area as the most effective for applying, refining, and testing an evaluation tool; continuing to build partnerships for the resilience effort; and developing a community education program. Including community voices has helped citizens own projects and share maintenance costs and ensure accountability for outcomes that reflect real community contexts.

Intentional Processes



Characteristic 4: Co-develop climate resilience projects with community residents

What.

Ready-to-Fund Resilience Projects are co-developed with the people most impacted by resilience decisions and directly integrate residents' knowledge and experience into project design and implementation.

Why.

Establishing a robust system for community co-development helps shift funding and finance resources to communities most in need. This approach may:

- Enhance community trust and buy-in around a project, a key prerequisite for funder interest.
- Better identify and prioritize the funding 'ask.'
- Increase eligibility for funding opportunities that include a robust vulnerability assessment and community engagement as part of the funding criteria.
- Grow investor support by establishing community buy-in.
- Ensure accountability to outcomes that reflect community needs and assets rather than those reflecting a predetermined view of what resilience should look like.
- Maximize project design and readiness for funding by supplementing content expertise (city planners and engineers) with context expertise (community residents).
- Ensure that community expertise (residents) supports content expertise (elected officials, engineers, etc.) to maximize project outcomes.





How.

In developing a funding and financing strategy for adaptation and resilience projects, leaders must address historical injustices by avoiding regressive tools and focusing on equitable processes and outcomes. This includes recognizing the social capital and expertise of communities that will pay for and be impacted by a project.

1. Reassess how community needs and assets are understood via more human-centric vulnerability assessments.

Conduct an equitable and human-centric vulnerability assessment to identify areas in a community that are particularly sensitive to climate impacts or that enliven residents' lives every day and in the event of an emergency. Consider incorporating holistic indicators and metrics that account for disparities in a community's capacity to adapt as well as health outcomes, social vulnerability, etc. This includes leveraging data sources that collect qualitative and quantitative data from community members, such as surveys and outreach sessions that provide information on what resilience means in the neighborhoods.

Likewise, strive to determine the root causes of local disparities to better inform local policy decisions. Consider flood mitigation, for example. Key climate adaptation strategies that address the root cause of such flood exposure include improving the equitable distribution of environmental amenities that reduce flood vulnerability. These include green infrastructure, strategies that improve housing quality and security and prevent displacing low income and minority households, financial services to secure property titles so residents can be eligible for recovery grants, and climate adaptation programs and investments that create new jobs and business opportunities for marginalized groups.¹⁴

2. Establish a platform for project co-development alongside community residents.

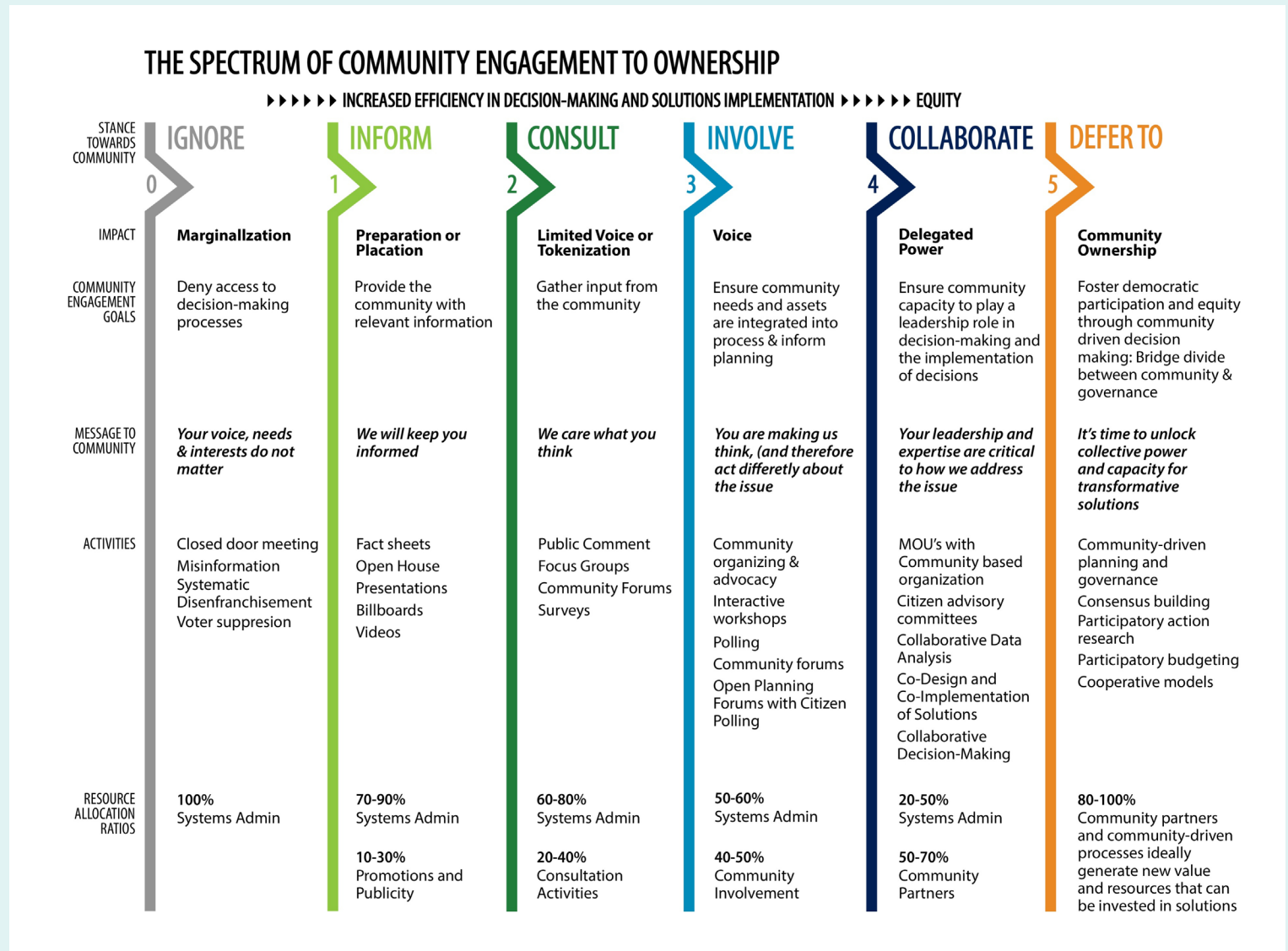
When making resilience decisions and paving the way for multi-generational transformation, design planning, policy, and program solutions alongside community members so they gain ownership over the outcomes and the process that gets them there. This means developing funding processes (e.g., application, review, reporting, etc.) with/by BIPOC communities that reduce their burden. This also means that community members define what resilience means to them.

For this to occur, municipal resilience leads and community-based organizations can develop an equitable and participatory design process that bridges spaces between engineers, planners, government officials, and community members. This process also can encourage other organizations and leaders to do the same. Involve communities early, often, and always in developing projects that communities need and support.¹⁴

The Facilitating Power Spectrum of Community Engagement to Ownership can help identify where a city's processes fit along the continuum of community co-development. It offers strategies to shift processes toward more holistic resilience project co-development. The content has been piloted with municipal community-centered committees for racial equity and environmental justice in Portland, Washington; Providence, Rhode Island; Seattle; and Washington DC; and with the Building Healthy Communities Initiative in Salinas, California, and developed in partnership with Movement Strategy Center. The [Spectrum of Community Engagement to Ownership](#) offers a continuum for facilitating a transfer of power to community leaders, which can help shift funding and finance to community-driven projects:



Figure 5: The Spectrum of Community Engagement to Ownership



READY-TO-FUND RESOURCES

Partners

Community organizations, community members.

Questions

What is fostering bottom-up leadership in climate resilience? To what extent do communities possess the self-determination and autonomy to set outcome priorities important to them? Are community members and community-based organizations active in planning, designing, executing, evaluating, and monitoring local climate resilience activity?

3. Ensure accessibility

Ensuring accessibility is a key component of this process. Identify sustainable and flexible funding sources to support prolonged engagement processes and provide community support (e.g., childcare, food, stipends, travel, translation). If in person, the venue should be accessible by public transportation and in a space that is ADA-accessible. Communications should be exchanged in the languages that reflect the surrounding community, and arrangements should be made to accommodate community members with limited resources, mobility, or time to ensure they have ample opportunity to participate. It is also best practice to pay community members for the time they invest in co-creation, just as the other experts are paid for their time.

Resources

A number of tools exist to incorporate equity into planning and budgeting processes as well as in procurement and contracting.

[Georgetown Climate Center Equitable Adaptation toolkit](#) highlights emerging practice examples of how local governments address disproportionate socioeconomic risk to climate impacts and engage overburdened communities, as well as how they move beyond equitable adaptation planning and execution of policies that address social equity and climate resilience. The toolbox benefits local governments and community-based groups that focus on equity in their adaptation efforts.

[Facilitating Power's Spectrum of Community Engagement to Ownership](#) uses various public participation tools that focus on municipal community-centered committees for racial equity and environmental justice in the cities of Portland, Providence, Seattle,



Characteristic 4: Co-develop climate resilience projects with community residents.

SAMPLE ACTIONS

Short Term

Connect with organizations with strong ties to local communities to build relationships and mutual trust.

Recruit partners (local neighborhoods, nonprofits, academia, and government) to host community-centered resilience training to support creation of a collaborative resilience plan.

Longer Term

Strive for policymakers to institutionalize practices that support meaningful and inclusive co-ownership processes.¹⁴

Develop an equitable and participatory design process that bridges spaces between engineers, planners, government officials, and community members. Encourage other organizations and leaders to do likewise.

and Washington, DC; and the Building Healthy Communities Initiative in Salinas, California, developed in collaboration with Movement Strategy Center.

The [USDN Guide to Equitable Community-Driven Climate Preparedness](#) addresses gaps in particular adaptation strategies, inclusive community involvement techniques, and core causes of climate risk inequity. It discusses advantages of community-centered planning for maximizing climate preparation action among low-income communities and communities of color, and addresses how to increase resilience by letting those most impacted determine the choices that will affect their lives.

City of Seattle [Inclusive and Public Engagement Guide](#) provides guidelines about inclusive public engagement useful for local government staff. The guidelines focus on building strong and sustainable relationships and partnerships with people of color, immigrants, and also on recognizing how diversity and a healthy democracy requires outreach and public engagement. (A quick guide to the ‘Key Steps to Inclusive Public Engagement’ can be found on pages 10–12.)

NOAA’s [A Seat at the Table: Training for Whole-Community Climate Resilience Planning](#) offers a learning resource to help “coastal resilience planning practitioners incorporate the needs and perspectives of socially vulnerable populations into resilience planning using inclusive, community-driven processes.” The resource provides helpful checklists, visuals, and examples, and an overview of whole-community planning with resources for identifying and engaging socially vulnerable populations.

SAMPLE ACTIONS (cont.)

Ongoing

Include resources and capacity to engage with community members and build relationships that endure within the funding scope for climate resilience projects.

Ensure proactive outreach is inclusive and caters to the needs of people who speak different languages, are disabled, are single parents or elderly, etc.

Example.

In 2014 in Fresno, California, local leaders and state officials started conversations to identify ways to catalyze private investment at scale, especially near the high-speed rail station and surrounding neighborhoods. Their solution was the [Transformative Climate Communities \(TCC\) program](#), which combined private investments to support local climate action in the top five percent of disadvantaged communities. In perhaps the country's largest community-based participatory budgeting, Fresno leaders employed an open steering committee to design, select, and help execute the most effective programs. Hundreds of residents attended because anyone who lived, worked, or owned a business or property in the neighborhoods eligible for TCC funding could participate and vote on projects. They simply had to meet a threshold of attendance at the regular Community Steering Committee meetings. A consulting facilitator, multiple staff members from the city, and support from the Central Valley Community Foundation effectively administered the process. By year-end 2017, [a package of projects proposed by local residents](#) had been selected over four other alternatives and had acquired \$77 million in funding from the State of California with further investments of [\\$216 million across 25 projects](#).

Intentional Processes



Characteristic 5: Seek a variety of funding and finance types to cover all stages of project life

What.

Ready-to-Fund Resilience Projects combine funding and finance from a variety of funding sources, referred to as ‘blended finance’ to cover all stages of resilience building from community co-development and project design to execution and longer-term monitoring and performance measurement. Blended finance may include commercial debt and equity, grants, concessional loans, subsidies, and other public support.¹⁵

Why.

Leveraging blended finance can:

- Support funding of climate resilience proactively in the wake of disruption.
- Expedite the funding process.
- Enhance project competitiveness for funding opportunities by bolstering funder comfort
- Cater to the development and application of climate adaptation plans with a longer-range timeline.
- Ensure that all components of the climate resilience-building process are covered, including grant writing, project planning and design and execution components.
- Open up opportunities for new sources to cover grant match requirements.



How.

1. Stack a variety of funding and finance sources.

It is unlikely that a single panacea exists for a community's funding and finance needs. Thus, consider how various financial instruments can be combined at various climate resilience project stages and/or for various deliverables.

Different funders may be more compatible with differing components of resilience funding and finance. Search for philanthropy and state and federal fund requirements and use them as the basis for modifying resilience projects to suit funder criteria and identifying what funding source might prove the best fit for various components of climate resilience-building. For instance, philanthropies may be best aligned to cover community outreach campaigns, while energy retrofits can be financed by utilities, aided by local energy rebates.

Figure 6 below offers a sample investment structure for more complete climate resilience projects and signals what type of funding and finance may best align with each stage.



2. Incorporate innovative funding mechanisms such as social impact bonds, parametric insurance, and loans from community development finance institutions

Besides pursuing federal, state, private, and utility grants from departments such as FEMA and HUD or state revolving loan funds, local governments can employ various ways of raising revenue for climate resilience-building tailored to their political situations, fiscal conditions, and legal barriers. Financing facilitated by banks, cooperative societies, and other nonbanking institutions differs from a pay-as-you-go funding

approach. Debt financing measures often entail lending money on the promise of future payment with a return generated from taxes or fees. Some governments raise climate resilience funds by bonding against future tax or fee revenue through long-term borrowing of private capital. Tapping money generated by carbon-pricing is another option for places with a carbon market. Other revenue-raising methods under consideration in states include surcharges on property insurance. For additional insight into potential finance mechanisms to leverage, consider [Appendix A](#).

3. Work with partners on strategies about the types of funding or finance to pursue and at what time for types of projects.

Engaging the right people is essential for stacking diverse climate resilience funding and finance sources effectively. Key opportunities include:

- Engage key municipal professionals, such as finance and legal, and banks, investment firms, and other organizations in discussing opportunities to pilot innovative financing mechanisms or to leverage existing ones to fill gaps in resilience funding and finance.
- Reach out to local and regional partners and state agencies to identify the grant opportunities available for resilience. Besides federal grants, identify potential grant opportunities from state agencies, utilities, philanthropies, and other impact investment organizations.
- Interview field experts and engage your chief financial officer to better understand sources of capital, especially available debt service capacity. Consider the mechanism for money flow and how local government will be affected.



- Seek internal champions to engage the local government finance department and pitch the value of resilience funding and finance. For additional insight, see [Characteristic 2](#).
- Seek partners from regional funders and finance organizations to educate stakeholders on innovative funding mechanisms. Engage with local governments that have had success with these mechanisms to better understand the mechanisms and boost buy-in.

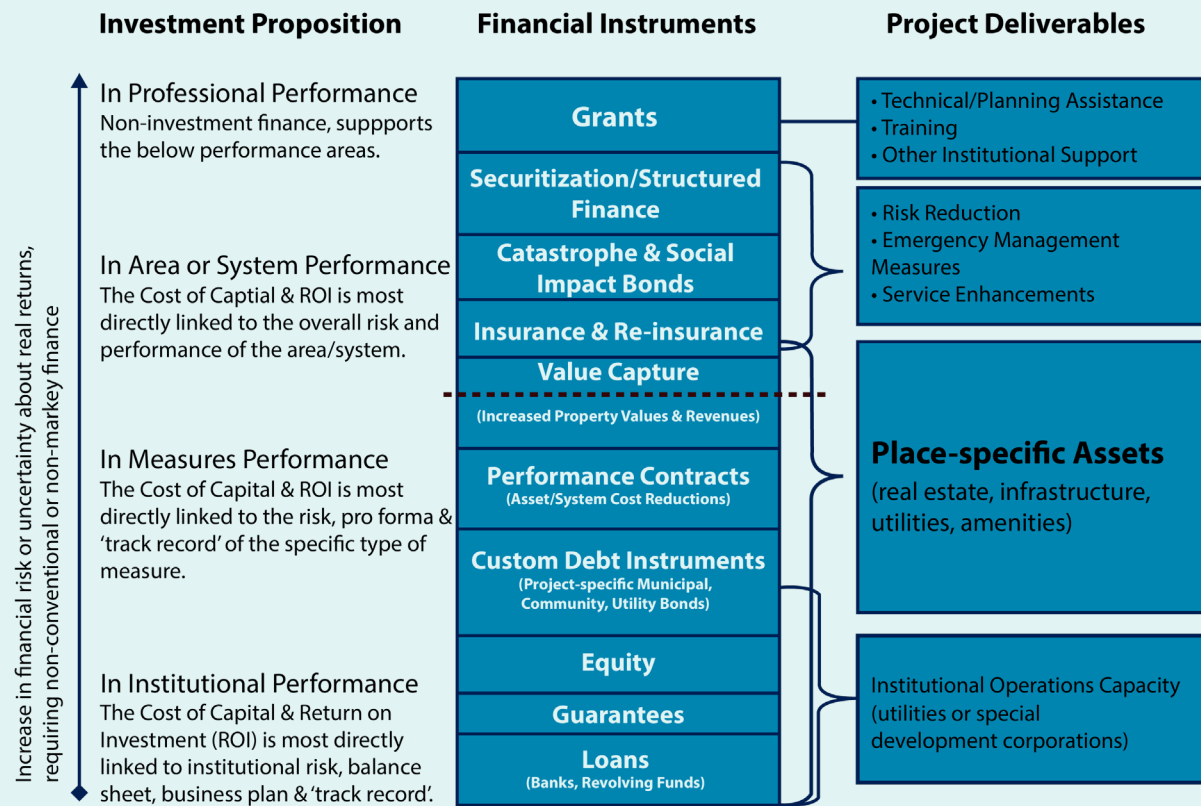
For additional insight into how key partnerships can support climate resilience funding and finance, see [Characteristic 1](#).

4. Fight the urge to shy away from debt financing.

Several reasons explain why larger projects may use debt financing rather than a pay-as-you-go approach:¹⁵



- Larger infrastructure and development projects often require upfront capital investment larger than the resources readily available at development time.
- Financing allows revenues generated by a project, such as user fees collected over the course of the asset's lifetime, to be used to pay for the asset.
- Infrastructure assets can have long life cycles, in some cases between 75–100 years. By financing a project over the longer term, the spread-out cost is borne in part by future users who also may benefit from the asset.
- Financing can facilitate a shorter construction period since all the necessary funds can be made available upfront¹⁵



- When municipal bond interest rates are low, it is fiducially prudent to borrow in order to fund more resilience projects sooner (since avoiding future losses has significant payback, as described in [Characteristics 2 and 7](#)).

Further, resilience projects can encourage the use of an array of financial instruments and do more to attract different kinds of investors. The right financial instruments can make sustainable infrastructure investments more attractive to potential investors by reducing transaction costs or due-diligence requirements; mitigating risks to provide steadier, more certain cash flows; and providing additional liquidity that makes it easier to get in and out of investment.

Figure 6: Investment Structure for Blended Finance. Adapted with permission from Jeb Brugmann's [Financing the Resilient City: An ICLEI White Paper](#).

Figure 6 (above), from Jeb Brugmann's [Financing the Resilient City: An ICLEI White Paper](#)¹⁶, offers a sample investment structure for more complete climate resilience projects and the types of funding and finance that may best align with each stage.

READY-TO-FUND RESOURCES

Partners

State and federal resilience leaders, regional utilities, philanthropies, impact investment firms.

Questions

What is our funding and finance strategy? How are we approaching the funding process to better cover all elements of the resilience building process? What are additional funding sources that could be incorporated into our portfolio?



Resources

[Climate Adaptation Finance and Investment in California](#) by Jesse M. Keenan provides a framework for asset management and public finance systems and guidance for finding prospective financing sources for local governments and commercial firms in climate change adaptation and resilience. (Decision tree for climate adaptation asset assessment on page 19, Table about Opportunities to integrate climate change adaptation to asset management plans and policies on page 31–32, chart for adaptation funding and financing on page 38–29, chart about Climate-related risk, opportunities and financial impacts on page 93, Map of climate services activities on page 104)

[Green Recovery and Finance for Sustainable Infrastructure](#) offers finance options to help drive a green recovery by adequately supporting the early phases of infrastructure project development (pre-development) to ensure long-term success. (Page 8, Project Planning and Development Cycle is an overall reference for green recovery strategies.)

[Financing Climate Resilience: Funding and Finance Models for Building Green and Resilient Infrastructure in Florida](#) includes innovative finance and financing strategies that may accelerate investment in infrastructure projects with resilient design elements. (Pathway to a Resilient Infrastructure Program diagram, page 6) Prepared by Laura O’Connell and Kyle Connors at the Harvard Kennedy School for the Nature Conservancy, Florida Chapter.



[Federal Funding Opportunities for Pre- and Post-Disaster Resilience Guidebook](#) prepared for the National Association of Regulatory Utility Commissioners encourages informed discussion with stakeholders about risk-reduction or mitigation programs. Different sections focus on such educational components as program summary, eligibility requirements, important deadlines, and key takeaways that link each program to a utility commission's priorities. (Overview of programs page 6, is a resource for federal funding)

Climate Finance Advisors, BLLC (CFA) tracks federal funds useful for actors at various jurisdictional levels (states, local governments, tribes, etc.) on an ongoing basis. A snapshot as of September 29, 2021, can be found in [Appendix A](#). It also draws from the [Connecticut Financing and Funding Adaptation and Resilience Working Group](#) report appendix of federal funding resources.

[Cities Advancing Climate Action: Leveraging Federal Funds for Local Impact](#), a resource guide prepared for by the Alliance for a Sustainable Future, is an inspiration and a practical guide for cities at the center of advancing climate and resilience priorities for communities that are in a position to make an even greater impact in their communities. With funding from the Infrastructure Investment and Jobs Act (IIJA), the Alliance for a Sustainable Future, a collaboration between The U.S. Conference of Mayors (USCM) and the Center for Climate and Energy Solutions (C2ES), has developed a collection of case studies that highlight what cities can do now to preposition for funding, plan for co-leveraging diverse funds, and develop projects to capture maximum community benefits.



Characteristic 5: Seek a variety of funding and finance types to cover all stages of project life.

SAMPLE ACTIONS

Short Term

Pursue multi-function projects that qualify for a range of funding sources.

Work with partners on strategies about the types of funding or finance to pursue and at what time for types of projects.

Longer Term

Incorporate innovative funding mechanisms, such as social impact bonds, parametric insurance, and loans from community development finance institutions

Stack a variety of funding and finance sources to fulfill funding needs for all stages of climate resilience-building.

Ongoing

Consider how private, state, and local funding sources can serve as a match for federal grants, and not federal to match federal.

Example.

Founded in 1858, the historic Mount Olivet Cemetery in Washington, DC, had increasingly limited space and, by 2017, had **found itself shifting focus** from burials to long-term maintenance. Realizing a growing need for new revenue streams, the Catholic Archdiocese there worked with The Nature Conservancy (TNC) to cover future costs through an innovative green infrastructure project. Its initial phase consisted of replacing impervious surfaces within cemetery grounds with water-retaining green infrastructure, and this phase's construction costs were covered by private investment from TNC. The costs of the next phase, long-term maintenance of the rain gardens and greenspaces, relied on two other financial strategies. First, the removal of impervious surfaces grants **reductions to the charges on its District of Columbia water bill** based on impervious surface area. The new rain gardens also supported applications to local relief programs that further reduced this water bill. Second, the new green infrastructure allowed the cemetery to generate stormwater retention credits to be sold on the Washington, DC, **Stormwater Retention Credit (SRC) market**. Importantly, local government incentives have established a price floor and ceiling for this market, allowing **greater confidence in SRC suppliers' income**. With lower water bills and an established SRC income going forward, Mount Olivet Cemetery covered maintenance costs of its new infrastructure project as well as the rest of its property.¹⁷

Intentional Processes



Characteristic 6: Bundle projects by program to pursue joint funding and finance

What.

Ready-to-Fund Resilience Projects are bundled regionally, by program, or by hazard to create economies of scale for project implementation and increase the likelihood of obtaining funding and finance.

Why.

Bundling climate resilience projects can:

- Improve eligibility for funding.
- Position communities to fund and finance opportunities, such as federal economic stimulus funds, when they arise.
- Attract a greater diversity of investors.
- Allow for cost-sharing
- More effectively align disparate funding sources.
- Facilitate the exchange of local know-how and understanding of innovative financing mechanisms—particularly those that seem new, unknown, or potentially unfavorable
- Improve ability to scale.
- Lower project development costs.
- Mitigate financial risk.
- Give voice and control to local municipalities via a regional jurisdiction.
- Ease long-term monitoring and maintenance.
- Cover the costs of the harder-to-fund resilience-building components.
- Anticipate and achieve optimal outcomes of community-led relocation; direct investments to lower-risk areas.



The Federal Department of Transportation encourages project bundling to expedite delivery, reduce costs, and improve efficiency. This can be applied to local governments as well. However, it is critical to note that other federal funding programs may not want to see single applications for multiple projects, or sometimes even more than one phase of a single project, based on concerns over complexity and uncertainty about which elements will move forward.

How.

1. Identify a vehicle to support project aggregation.

By nature, resilience projects must adapt to each unique neighborhood context, need, vision, and microclimate. Yet, having the foundational structure between each project and the ability to draw out similarities across them at a regional level can serve as the basis that makes scalability of the concept more palatable and intriguing.¹⁷ This can include key components that each project needs included, such as solar storage or larger systems that require regional investment, such as green infrastructure investments to mitigate flooding through a watershed. The more projects begun, the easier it will be to secure and scale funding and finance for equitable climate resilience.

To better manage funding and pool resources, work with regional facilitators to organize funding on a program rather than a project basis. Local governments cannot do this bundling alone. A vehicle must attract and maximize funding and financing impact by pooling resources or creating joint or blended public and private financing. Intermediaries such as development banks, green banks, or even certain local banks can facilitate this.



2. Develop a ready-to-go pipeline of climate resilience projects.

Develop a ready-to-go pipeline of projects to help resilience projects exploit funding and financing opportunities that arise. If a project has some funding, it can be difficult to generate support from certain funders. Likewise, support often is available only to projects with a completed design. So it is important to find the special window between projects “ready for funding” and “shovel-ready design.” Still, for projects to be resilient, they should be designed based on the best available data on future risk. Some projects in the pipeline for years may be based on out-of-date risk profiles or do not even take climate change into account. Equally challenging, some in the design or engineering professions are not familiar with assessing and addressing climate risk in their concepts and designs.

One solution is for local governments—in partnership with private sector developers, community organizations, and nonprofit organizations—to design numerous resilience projects and get them ready for funding. These pipelines, ideally drawn from existing local government plans, may comprise a variety of projects: constructing new stormwater parks and sea barriers, for instance, or retrofitting a water treatment facility, elevating a bridge, roadway, pedestrian walkway, or implementing green infrastructure for stormwater mitigation.

Pipeline development includes:

- Assessing the need for a project and the options for meeting the need.
- Being explicit in procurement documents about the future risk scenarios the project must address.



- Defining a project, its scope, design, and likely budget requirements, including community engagement and long-term monitoring and maintenance.
- Considering the feasibility and commercial viability of a project, possible funding options, and review of applicable laws and regulations.
- Identifying the consents necessary to implement a project, especially regulatory permits and land rights, and proving that each can be obtained.
- Preparing a full funding/financing plan for prospective investors.

3. Work with regional facilitators to organize funding on a program rather than a project level.

Reflecting the holistic nature of climate resilience projects, their leaders likely will need to leverage multiple funding sources—including grants and innovative financing mechanisms—to cover costs for project design, execution, and ongoing maintenance and monitoring. (See [Characteristic 5](#) for additional details). To secure funding most effectively for grant matching requirements, local governments can aggregate small-scale projects with the same goal—say, stormwater management or urban heat island mitigation.

To support this work and further engage community resilience leaders, back regional climate resilience design competitions. For example, The New York City and San Francisco Bay regions conducted elaborate competitions (Rebuild by Design and Bay Area Resilient by Design) with funding from philanthropies to identify essential resilience projects at parcel, site, neighborhood, community, and landscape or watershed scale.



When pooling resilience projects by program and/or across the region (see [Characteristic 5](#)), discuss with partners opportunities to apply innovative financing measures across the region. In particular, consider how different project types and bundling arrangements may be more appropriate for different financing opportunities.

READY-TO-FUND RESOURCES

Partners

Development, green, and infrastructure banks; Local government staff involved in project management who may serve outside the department where the resilience work is being applied but who share project priorities and timelines, etc.; Academic institutions to support project design.

Organizations such as Trust for Public Land (TPL) and The Nature Conservancy that develop “nature-based” projects protecting ecosystems and strengthening local resilience, especially in rural communities. Nature-based solutions often are best approached from a systems level; thus engaging these organizations may deliver insight such as bundling and identifying viable regional partners.

Questions

What is your resilience project pipeline? What other regional projects in the planning/design phase align with your project objectives? How could a bundle better serve these projects?

4. Set collaboration priorities with neighboring jurisdictions.

Jurisdictional collaboration is critical to ensure the most appropriate jurisdiction pursues funding and that those pursuits align with regional neighborhoods. For example, FEMA Building Resilience Infrastructure and Communities (BRIC) and American Rescue Plan Act (ARPA) for smaller governments flow through states. So local governments must communicate and coordinate with states to fund their plans and projects. Likewise, rather than building a new stormwater management plant in one community that would require both upfront capital and staff for operations and maintenance, an existing plant in a neighboring jurisdiction could be expanded instead. This could save costs for both jurisdictions and provide a sense of confidence to potential investors in terms of project scale and level of municipal involvement.²

Resources

The Global Fund for Cities Development’s report, [Aggregation Interventions to Increase Urban Climate Finance](#), a knowledge product of the Cities Climate Finance Leadership Alliance,

provides a framework for aggregating interventions (including city co-creation platforms) that can increase funding and finance for small and medium-sized climate projects. The report also highlights platforms of aggregation and matchmaking, including [CDP Matchmaker](#), [ICLEI TAP](#), and [SDIP](#). In particular, consider section 2.3: ‘Aggregated inputs that increase the pipeline of investable projects and investment vehicles,’ beginning on page 32 for aggregation strategies that create enabling environments and increase the ability to invest in urban projects. Section 2.4 (page 42) also offers examples of aggregation at the city level through public procurement.

[Unlocking Green Infrastructure Financing](#) from the State of New Jersey serves as a roadmap for applicants that consolidate information when moving from an initial funding inquiry to final construction expenditures related to green infrastructure. This guide benefits applicants for green infrastructure financing by providing an overview of the financing available from the Water Bank for green infrastructure, clarifying the sequence of required application activities, and defining the standards that must be met at each step along the way. (See page 6 for eligible projects and page 12 for financing details.)

The Federal Department of Transportation has assembled a [project bundling database](#) for six state transportation departments and a county bridge renewal project. This resource offers guidance on the program bundling process that can trigger local level action opportunities and identify existing programs by state. It gathers information on project bundling including how, why, and by whom. The database was generated as part of the Federal Highway Administration’s Every Day Count Five (EDC5) Project Bundling. It contains case studies, contracts, programs, references, and research. Case



studies include 12 state transportation departments and some county projects. (More information about case studies at [Bridge Bundling Guidebook](#).)

The Georgetown Climate Center's [Managed Retreat Toolkit](#) contains a variety of legal and regulatory options that state and local governments might use to support controlled retreat in vulnerable coastal communities affected by sea-level rise, floods, and land loss. It can assist state and municipal governments to assess risks and develop valid legal solutions. It also offers insights into how and when to talk about managed retreat.



Characteristic 6: Bundle projects by program to pursue joint funding and finance

SAMPLE ACTIONS

Short Term

Engage with development banks or other regional facilitators to design and implement resilience projects by program rather than project.

Longer Term

Work with regional facilitators to organize funding on a program rather than a project level.

Ongoing

Develop a portfolio of resilience projects that align with community priorities and climate projections.

Set priorities for collaborating with neighboring jurisdictions.

Example.

The Rhode Island Infrastructure Bank is tasked, in part, with providing affordable financing for municipal governments to engage in energy efficiency projects. Its calculations showed that at least 10 municipalities would need to join together, creating a portfolio of projects with sufficient size, composition and diversity to earn a high credit rating for a public bond issuance.

To overcome a lack of standard independent information among local governments with energy efficiency projects, the infrastructure bank used a pool of grant funding to help cover the upfront costs of energy efficiency audits in municipalities. These audits then allowed it to determine the economic value of potential projects for bond investors.¹⁸

By aggregating multiple municipalities' energy efficiency projects, the bank used a pooled loan approach that created below-market interest rates on the clean energy loans to municipalities. In addition, by mobilizing long-term private capital in the bond market, it provided financing for clean energy projects in more municipalities.¹⁹ Secured by municipal bonds, the infrastructure bank has provided loans for energy efficiency projects in over 30 municipalities across the state.²⁰



Innovative Accounting Practices



Characteristic 7: Use comprehensive accounting practices that make a strong business case for action

What.

Ready-to-Fund Resilience Projects take an innovative approach to project accounting practices to make a stronger case for climate resilience projects and to communicate the benefits they bring to communities in the language that drives financial decision-making: dollar value.

Why.

The conventional approach to cost-benefit analysis is incompatible with current climate adaptation needs. The inputs, valuation method, and time horizons require significant reassessment:

- **Scope:** Traditional Cost-Benefit Analysis (CBA) is infrastructure-centric and lacks a holistic, human focus. It excludes savings in maintenance and operations for assets, replacement costs and lost opportunities, as well as the holistic social and environmental benefits that accrue after project completion.
- **Equity:** Traditional CBA considers the value of the asset, which allows higher-priced parcels/assets/systems, etc. to be valued higher than lower-priced assets. Most of these lower-priced assets are owned by LMI populations, many of which also identify as minority & BIPOC communities. This means the discounted value in the CBA produces an indirect but very real negative impact on those communities. In essence, traditional CBA moves money away from climate resilience, favoring things with immediate benefits, and causing a negative



impact on communities most in harm's way. LMI and BIPOC communities, in particular, become more vulnerable because of how value is captured in traditional economic assessments while wealthier communities receive an indirect positive impact. [Appendix B](#) includes further information about discounting.

- **Timeframe:** In traditional CBA, immediate needs tend to outweigh longer-term considerations. The public is less likely to focus on “further off” issues such as climate change when they have lost their job, local governments are losing revenues from an inability to collect taxes, renters are being displaced, etc. Although climate resilience ties inextricably to many of these day-to-day issues, the benefits of climate resilience investment may take years or even decades to be realized. Consider a wind turbine. You set it up and it provides power. But with, say, green infrastructure, before the turbine's benefits are felt, it has to physically grow, or it must protect houses from a storm before it's true benefits are felt. This is a challenge as investors and the community favor benefits that can be seen and measured immediately.

How.

1. Internalize project co-benefits to conduct a triple bottom line (social, environmental and financial) cost benefit analysis.

The triple bottom line (otherwise noted as TBL or 3BL) is an accounting framework with three parts: social, environmental (or ecological) and economic. Consider green infrastructure projects, such as wetlands restoration, brownfield remediation, or urban reforestation, that involve a network of “ingredients” for solving urban and climatic challenges by building with nature. In addition to maintaining water quality and mitigating flooding, such installations can clear and cool the atmosphere. This improves



public health and lessens basement flooding. This improves property values and saves owners and renters money. It boosts tourism, which attracts business and produces tax revenue; and it reduces stormwater to treat that lowers public utility costs.²¹

Too often, the dialogue around climate resilience investment only weighs avoided losses against the physical costs of the (gray) infrastructural investment. This conversation usually occurs after disaster strikes. While much work still must be done to account more effectively for these sorts of hard cost savings, it is critical that resources are also invested in the quantification of more holistic costs and benefits. It is essential to highlight proactively that these investments yield a triple dividend because it shifts the focus from the solely upfront project costs to include the cascading benefits over time.

Recently, FEMA incorporated ecosystem benefits into its [CBA tool](#). It is a critical first step toward legitimizing nature-based climate solutions. Still, much more must be done.



2. Pursue innovative strategies to monetize the “intangible” benefits.

Certain values, such as avoided energy costs, can be determined easily via their market price. However, many values do not have a direct market value—such as the value of social connectivity, costs of trauma, loss of community caused by a hurricane or wildfire, or costs of relocating from one’s community. Much of the developing research on approaches for incorporating these more holistic benefits from resilience projects that extend beyond the value of protecting assets remains theoretical. For these concepts to gain traction, they must be applied in a real-world setting.

Seek partnership with local think tanks, groups, and academic institutions to put a value on holistic community co-benefits from resilience investment (as well as the hidden costs of in action). Contingent valuation offers one solution. This economic survey technique elicits willingness to pay for outcomes such as health or that don't have an obvious price tag. Unfortunately, contingent valuation is both time- and resource-intensive.

Another opportunity that is more accessible than content valuation is value transfer. See resources below for insights into how to apply this practice to your CBAs.

3. Correct the misaligned planning horizon of climate resilience investments.

Even if all co-benefits are internalized, the challenge of common discounting practices persists. They are designed to take into account the variable timescales over which costs and benefits are distributed. They give very low weight to far-off events, namely the social and environmental benefits of resilience projects. Consequently, by discounting, CBA appears to make these benefits disappear. This is tragic because this planning horizon centers on short-term impacts and costs and fails to capture the full value across all areas: social, environmental and economic. Consider engaging your CFO to discuss alternatives in this space. For additional insights into these opportunities, see [Appendix B](#).

4. Center Equity.

A significant gap persists in the climate resilience field around incentives that focus on proactive resilience and favor LMI and BIPOC communities. In fact, current CBA analysis mandates and favoring present-day returns over potential avoided future costs



READY-TO-FUND RESOURCES

Partners and Capacity Support

Local academic institutions and economic think tanks, innovative investment and engineering firms.

Practitioners and consulting firms (and others) with experience in bridging the theory and practice of CBA, familiarity with dealing with uncertainty, and bridging the space between the finance world and the day-to-day needs of the municipality, asset owner, community, etc.

Financial institutions that have used alternative accounting to support resilience projects such as Quantified Ventures, Naturevest, Calvert.

Questions

Does the process we use determine who and what we prioritize to serve our interests? Who decides which community outcomes we value? What should our criteria be in determining what community outcomes we value?

and long-term holistic community benefits disincentivize equitable climate resilience priorities. With the right standards and incentives in place, these priorities can shift.

Sometimes the most valuable data to inform climate resilience decision-making are numerical/quantifiable. Yet, qualitative data from surveys and community interviews can more effectively engage community members in designing and collecting data and prove valuable. Ideally, quantitative and qualitative data combine to form a more complete and accurate story. For additional insights into embedding equity into funding and financing processes, consider [Characteristics 3](#) and [4](#).

Resources

Many strategies exist to shift how cost-benefit analysis is approached. What is being valued? Who is at the table when value is decided? Over what time period are these impacts considered? See [Table 6](#) (next page) for examples.

General Resources

The National Institute of Science and Technology (NIST) [Economic Decisions Guide](#) summarizes the CBA process, and the accompanying [Community Resilience Economic Decision Guide for Buildings and Infrastructure Systems](#) provides more detail (pages 15–30 in particular).

The [2019 Mitigation Saves Report](#) from the National Institute of Building Sciences includes cost-benefit ratios for various risk mitigation strategies, ranging from adopting international building codes to undertaking private sector building retrofits. For details, see page 2.

TABLE 6: THREE WAYS TO IMPROVE COST-BENEFIT ANALYSIS

| What is being valued? | What is the Accounting Timeframe? | Who receives benefits and who bears costs? |
|---|---|--|
| <p>Key Considerations Are we creating a business case that includes upfront capital costs and longer-term savings in maintenance and operations that are benefits related to increased health and safety? Do we consider how it stabilizes and/or increases the tax base, economic position, and community livability aspects, etc. .</p> <p>How To</p> <ul style="list-style-type: none"> • Internalize project co-benefits to conduct a triple bottom line (social, environmental and financial) cost-benefit analysis. • Pursue innovative strategies to monetize the “intangible” benefits. | <p>Strategic Messages Have benefits and costs that accrue beyond a construction timeframe been considered? Has the project’s real useful life been explained and accounted for in decision-making? For additional information around alternative discounting practices, consider Appendix B.</p> <p>How To</p> <ul style="list-style-type: none"> • Correct the misaligned planning horizon of climate resilience investments by using alternative discount rates. • Engage your CFO to discuss an alternative CBA. • For additional insight into these opportunities, see Appendix B. | <p>Strategic Messages Who judges the project to be worthwhile from the standpoint of the use of local government resources? Are those who rate it highly in traditional positions of power, from the community, or who are historic beneficiaries of adequate public services? Who pays and who benefits from this work? Compared to other government-funded local projects, will this fund provide more or fewer resources to LMI and BIPOC communities?</p> <p>How To</p> <ul style="list-style-type: none"> • Wherever possible, set investment priorities for LMI and BIPOC communities. • Establish a platform for community and co-development (see Characteristic 4). • Value qualitative community data in addition to quantitative indicators. Cite the considerations described above within project discussions. |

Table 6: Three considerations for improving your cost-benefit analysis.

Headwater Economics Report, [How communities reduce flood risk: Five mid-western case studies](#), highlights success stories from Austin, Minnesota; Fargo, North Dakota; Grand Island and Lincoln, Nebraska; and Tulsa, Oklahoma. They showcase strategies of local and regional leaders to strengthen their communities and reduce flood risk. Together, these stories shed light on the range of solutions communities can employ to fund and execute projects that protect people and property from damaging floods.

NOAA’s [Guide to Assessing Green Infrastructure Costs and Benefits for Flood Reduction](#) offers a six-step framework to inform planning-scale assessments and spark discussion about green

infrastructure options to mitigate flooding and provide other watershed benefits. This guidance includes how to estimate associated costs and benefits over a chosen planning horizon and demonstrate cost-effectiveness.

The [Alliance for Global Water Adaptation’s Climate Risk Informed Decision Analysis \(CRIDA\)](#) is a methodology for water resources planning and management, particularly for water managers working in the developing world, if significant uncertainty exists

about future conditions. CRIDA provides a collaborative process for risk-informed decision making: effectively assessing, managing, and communicating risks to stakeholders and decision makers, including successfully avoided risks and residual risks that cannot be avoided, quantified, or isolated.

Measuring social and ecological co-benefits

Ganderton's '[Benefit-Cost Analysis of Disaster Mitigation: Application as a Policy and Decision Making Tool](#)' provides an overview of the CBA process and discusses the various alternative methods to measure (non-market) value.

'[Environmental Cost Benefit Analysis](#)' by Giles Atkinson and Susana Mourato focuses on monetizing environmental services.

Headwaters Economics' report, '[How to Use Economics to Build Support for Climate Adaptation](#)' uses case studies from large and small cities to describe how to effectively use economic data and methods, conduct economic analyses for climate adaptation, and communicate economic data to different audiences.

Correcting for the misaligned timeframe

The Manchester Metropolitan University [CBA Toolkit](#) details ways to account for a longer-term payback period in CBA.

The European Commission [Cost-Benefit Analysis of Investment Projects](#), especially Chapter 2 (page 25), offers a guide to CBA and accounts for the 'longer-term perspective' of project benefits.



The National Academies of Science’s [Guidebook on Incorporating the Costs and Benefits of Adaptation Measures in Preparation for Extreme Weather Events and Climate Change](#), including Chapter 2 (page 6), provides a thorough analysis of the process, including how to handle a longer-term payback period.

Centering Equity

[C40 Cities: The Co-Benefits of Sustainable City Projects](#) delivers information on alternative analysis methods to CBA.

The Headwaters Economics article, “[Improving benefit-cost analyses for rural areas,](#)” describes how current CBA can be inequitable, and gives recommendations on how to improve it.

Online CBA Software Tools

General Cost Benefit Analysis

[FEMA CBA Toolkit](#): online software tool that quantifies costs and benefits for a range of major natural hazards and project types, including flood, tornado, hurricane wind, earthquake, wildfire, drought, and landslides. The accompanying [user guide](#) navigates the platform. This tool is best for users familiar with the FEMA BCA system. While it can quantify the extent to which hazard mitigation measures may reduce injuries, loss of life, hardship, or the risk of future damage and destruction of property, the tool lacks a holistic approach and does not consider other social and environmental factors. More information is available in the [FEMA Report on Costs and Benefits of Natural Hazard Mitigation](#).





Power

The [FEMA CBA tool](#) integrates “damage costs of increased injuries and lives lost from degraded critical services during power interruptions.”

NREL’s [REopt model](#) offers resources to evaluate Distributed Energy Technologies.

The [Interruption Cost Estimate](#) (ICE Calculator) developed by Lawrence Berkeley National Laboratory tool can help estimate power interruption costs and related reliability benefits.

Green Infrastructure

A [Green Roof Energy Calculator](#) developed by the Green Building Research Laboratory allows any building owner to estimate potential energy savings.

[AutoDesk Triple Bottom Line Analysis Tool](#), available via subscription, analyzes civil infrastructure project design for such factors as public benefits of improved water quality, and increased recreational and property value.

Heat

The City of Phoenix’s method for [monetizing lost or productivity \(morbidity\) from the Heat Island Effect](#) includes:

- Estimated temperature reduction from change in features.
- Estimated heat-related illnesses from the resulting change in temperature.



Characteristic 7: Use comprehensive accounting practices that make a strong business case for action

SAMPLE ACTIONS

Short Term

Partner with local academic institutions and economic firms to bring more holistic social and environmental project outcomes to the center of the cost-benefit analysis.

Identify and engage project beneficiaries (and, alternatively, those who would be harmed and/or deprioritized) to bring qualitative and quantitative community data into investment considerations.

Longer Term

Work with the local government CFO and other local academic or investment institutions to incorporate innovative discounting practices to accommodate the long-term time-frame of project co-benefits.

- Estimated cost of each heat-related illness.
- Combine, using relevant population for given location.

Air Quality

Models to quantify ecosystem services: [iTree](#), [inVest](#), and [biome-BGC](#).

[BenMAP](#): software that estimates the health impacts and economic value of changes in air quality.

Example.

A seminal example for the use of social and ecological values in rethinking resilience projects is New York City's (NYC's) [Watershed Protection Program](#). To meet EPA regulations, traditional water quality practices dictated that NYC construct a water filtration plant costing [up to \\$10 billion](#) in 1997, with annual operating expenses of several hundred million dollars. Facing such an untenable cost, city leaders sought ways to gather EPA waivers for water quality regulations. Officials recognized that instead of building a costly filtration plant, they could preserve and use natural environments to filter city-bound water. They embarked on a plan to pay for watershed management and regulation best practices in upstream communities. Land acquisitions, management programs, and other initiatives have since cost over [\\$2.5 billion](#). Additionally, the program has spent over [\\$270 million toward partnership programs](#) in the first 10 to 15 years to realize mutually beneficial outcomes for small and rural upstream communities that undertake watershed management practices. In total, this program not only sharply undercut the initial \$10 billion cost of building a new filtration plant, but also provided natural habitats, tourism, sustainable agriculture, and natural water quality filtration benefits for the region.

SAMPLE ACTIONS (cont.)

Longer Term

Raise the need for more clearly defined definitions and standards for what qualifies as a benefit, who is considered a project beneficiary, and to what degree it can support the transparent assignment of obligations of payment.²¹ If possible, partner to do so.

Ongoing

Show leaders how internalizing community co-benefits into a project and including the longer-term time horizon over which they accrue can shift the project cost-benefit ratio. Doing so can help highlight the policy gap between what is valued by a community versus what gets funded.

Continue dialogue that raises questions about what we value and who decides what we value.

Innovative Accounting Practices



Characteristic 8: Ground project processes and outcomes in climate resilience metrics

What.

Ready-to-Fund Resilience Projects use climate resilience metrics to attract investors by illustrating project potential, measuring project progress, and demonstrating project success.

Why.

Integrating resilience metrics into your approach to resilience funding and finance can:

- Foster an environment and means for ensuring accountability to project outcomes.
- Illuminate project prioritization.
- Align goals across government departments.
- Presents tangible change that is a hopeful and mobilizing alternative to risk messaging.
- Enable resilience project leaders to show the value and benefits of resilience projects that generate greater interest and buy-in from potential funders.
- Build political will and support powerful stories of progress and success.

How.

Unlike mitigation, the challenge with climate resilience metrics is that a set of standardized metrics doesn't exist that can be applied across the board. Instead, climate

resilience indicators are context-specific and intertwined inexplicitly with the regional geography, policy environments, sectoral priorities, and desired community outcomes.

Nonetheless, mandates are increasing from entities associated with funding and finance that require municipalities to monitor and evaluate various components of the resilience building process, predominantly tied to risk mitigation. Establishing a resilience metrics framework will prove increasingly important for eligibility and proof of concept.

The [Resilience Metrics Toolkit](#) offers a framework to support this process. The information below reflects its guidance for developing and using indicators and metrics.

1. Bound and assess context

Defining and bounding an issue or problem clarifies the scope of your adaptation effort, which is a critical foundation for success at subsequent steps in the process. Key considerations include:

- Current problems.
- Current or likely future opportunities.
- Information gaps, especially those related to risk, vulnerability and assets; i.e., What is known and what isn't about current conditions, future risk and vulnerabilities?



- Decision context: Who are the relevant decision-making bodies, individual actors and/or jurisdictions that should be involved?
- Stakeholders: Who should be at the table in this adaptation effort?

2. Vision Success

To gauge success in your adaptation efforts requires knowing what “success” means to your stakeholders involved in your adaptation efforts.

Partner with community organizations on a clear and pragmatic vision of community climate resilience that aligns with your city’s priorities. Developing a common vision builds political will and engages the public. It also provides a motivational focal point for orienting your metrics strategy.

This vision must reflect stakeholders’ concerns, needs, and insights into what is most useful and desirable to them.



3. Explore and Identifying Indicators

An indicator is defined as “a quality, trait, or state of a system that suggests (“indicates”) or hints at something one is interested in. More specifically, an indicator is a sign that a particular set of adaptation actions are yielding the desired result and/or making progress in the right direction. Examples of indicators might include reduced damage to homes from flooding or uninterrupted food supply for all residents during storms.’

A metric, on the other hand, is a “variable that can be measured (if quantitative) or otherwise tracked (if qualitative) that represents the indicator.”²²

TABLE 7: DIMENSIONS OF ADAPTATION SUCCESS

| |
|---|
| Adaptation Planning Process |
| Adaptation Decision-making Process |
| The Adaptive Capacity of those involved |
| The Barriers to Adaptation to Overcome |
| The choice and implementation of adaptation actions |
| The Adaptation Progresses and Outcomes Achieved |

Table 7 (above): Dimensions of Adaptation Success.



When people are eager to measure progress and success, they may be tempted to jump right to concrete metrics. Often these metrics are based on data convenient to collect or obtain. Sometimes, the proposed metrics are those everyone else tracks, or they seem simple and intuitive. Instead, begin by brainstorming indicators and use this framing to guide your choice of metrics.

4. Selecting Indicators and Identifying Metrics

Resilience metrics serve a variety of purposes for city resilience leaders. In the past, some municipalities have focused mainly on climate indicators to track changes in climate conditions, or on vulnerability indices to understand con-

ditions on the ground. But focus is shifting to actually tracking adaptation measures. It is critical to integrate a diversity of holistic metrics and performance indicators for all stages of the resilience building process—from planning, project prioritization and execution, and ongoing monitoring and maintenance.

These metrics can help prioritize investments in line with the greatest risks, monitor resilience progress, and evaluate effectiveness of investments or programs, among other things. It is important to assess a diversity of metrics that address aspects of the implementation process, efforts to build adaptive capacity, the resilience actions themselves, and the myriad outcomes for agencies and communities. This holds us accountable to holistic resilience building, not just a sliver of the story.

According to the Resilience Metrics Toolkit, measures of adaptation success for a community, region, or organization requires investigating six dimensions. These categories can serve as a guiding framework to ensure consideration of a diversity of metrics.²²

5. Monitoring Indicators and Metrics

Implementing resilience metrics is all about drawing a line between a current problem and where your community wants to be in the future, and then setting metrics that orient strategies to hold up against such stressors as COVID-19 or climate impacts. Resilience metrics should serve as guide rails, informing decision makers of the direction required to realize their resilience vision, progress being made, and the course corrections necessary when needed.



SPOTLIGHT: EMBEDDING EQUITY IN RESILIENCE METRICS

Identifying frontline communities for priority projects provides a key prerequisite to an equitable resilience funding process. Local leaders can identify communities through a spatial review of community assets and vulnerabilities and from conversations with community leaders and community-based organizations.

The NAACP has identified pre-existing indicators of disproportionate exposure to climate risks relevant to adaptation. They capture the potential for compounding and accumulating risks and exposures. They include air quality; homes within a 10-mile radius of a hazardous facility or toxic site (including brownfields); and households with electricity and/or water shut-offs in the last 12 months.

READY-TO-FUND RESOURCES

Partners and Capacity Support

Academic institutions, state resilience offices, stormwater and energy utilities, impact investment firms, local businesses, community-based organizations working toward resilience, economic development, improved health outcomes.

Questions

How do we define resilience ‘success’ in our communities? What local government process are we trying to shift, and how can we track progress?

To secure capacity and resources for this continuous reassessment, ensure that ongoing monitoring lies within your scope for funding and finance.



Resources

[Resiliencemetrics.org](https://resiliencemetrics.org), supported by National Oceanic and Atmospheric Administration (NOAA) programs, offers a guiding framework for how to align resilience metrics to your unique municipal situation, explore and identify indicators, and track indicators and metrics. In addition, the site offers suggested indicators to consider in these categories:

Economic Indicators
Environmental Indicators
Governance Indicators

Infrastructure Indicators
Social Indicators

The United Nations office for Disaster Risk Reduction (UNDRR) provides several resources that frame resilience metrics relating to public health and the built environment:

- **Public Health Addendum:** Aims to strengthen and integrate coverage of the many aspects of public health issues and consequences of disasters not adequately emphasized in the original [Disaster Resilience Scorecard for Cities](#) (“the Scorecard”). While the more obvious health factors such as hospital service capacities and structural and nonstructural safety are covered in the Scorecard (under Essential 8), other disaster-related public health issues haven’t been well addressed. The Addendum should be used in conjunction with the UNDRR Scorecard, and WHO’s [Health Emergency and Disaster Risk Management \(Health EDRM\) Framework](#).
- **Building Scorecard:** Enables establishment of a baseline for the resilience of buildings and campuses to natural hazards or man-made disasters, allowing improvements to be identified and prioritized.” The Building Scorecard is intended for use by the owners, managers and operators of commercial, industrial and multi-residential buildings or campuses, both government- and privately-owned.²³



Example.

Since 2013, the City of Wheat Ridge, Colorado, has grounded its programs and annual budget by the metrics of its [Priority-Based Budgeting](#) program. Every year, city officials evaluate the previous year’s programming against the voiced goals of their community. Rather than just revise the previous year’s budget, officials [evaluate programs based on a list of different metrics](#), including program costs, impact, effectiveness,



Characteristic 8: Ground project processes and outcomes in climate resilience metrics

SAMPLE ACTIONS

Short Term

Work with community- based organizations, local business leaders to define a community's clear resilience vision.

Identify community partners and resources to support development and execution of a system for resilience measurement, seeking preferred metrics from the community.

Longer Term

Develop a diverse set of metrics that cover resilience planning and implementation processes, direct project impacts and community benefits that align with the vision.

Leverage the need for resilience metrics to develop more and better data about climate risk and make the case for funding to include capacity for long-term data collection, curation and maintenance.

Ongoing

Share data, resilience metric findings and adaptation lessons in accessible formats with colleagues in local government, funders, business leaders, community members, and other partners.

Consider progress toward process, output, and outcome indicators, and adjust accordingly.

Refine what indicators and metrics are centered in your approach to align with community priorities and outcomes.

and year-to-year variances. They then compare these metrics to community priorities. This metric-based approach for setting priorities allows the city to save money and invest in, preserve, and enhance those services the community values most. In 2018, this process translated into a **\$657,000 decrease in departmental budget costs**, allowing the city to fund critical programs and resilience measures. Year after year, Wheat Ridge sees large returns on investment in this process while **avoiding the displacement of important programs**, especially when budgets are tight.

Enabling Regulatory Framework and Policy



Characteristic 9: Clearly connect to existing local government plans

What.

Ready-to-Fund Resilience Projects are grounded within existing community plans in the context of a long-term climate resilience pipeline.

Why.

Grounding climate resilience projects within existing community plans can help secure funding and finance. The following list of actions can help secure such funding and finance as well as serve as their own outcomes:

- Offer certainty to investors, resulting in more funds available for projects since a wider range of funds can be tapped and set aside for the climate resilience agenda.
- Help local government leaders and partners better identify and act on synergies between projects to pool resources and share costs among them.
- Actively mitigate risk to entice investors.
- Address questions that credit rating agencies or investors may have, driven by the Task Force on Climate Related Financial Disclosure,²⁴ which provides guidelines for consistent climate-related financial risk disclosures (both physical climate impact risks and transition from fossil fuel risks) for use by investors.



How.

Use frameworks to integrate resilience goals into planning initiatives that inform investment priorities and pipelines. In particular:

1. Seek to mainstream climate resilience.

Resilience should be considered an integrated component of all physical and social infrastructure-related plans, policies, programs and investment decisions rather than an “add on” cost or feature. While creating new funding streams for climate adaptation and resilience projects is well-meaning and important, it could create an unnecessary and unhelpful distinction between “resilience” and “non-resilience” projects.

Reflecting a changing climate, every local government plan—for hazard mitigation, transportation, healthcare, water services, etc.—must include assessing and addressing climate risks via climate resilience. Investments that stem from these plans and are unable to withstand future climate change and/or do not have the flexibility to create resilience over time will lead to greater losses and costs in the future.

For additional insight into how to do so from a policy perspective, consider [Characteristic 10](#).

2. Establish long-term planning.

Climate resilience investments aren’t truly resilient unless they can withstand the evolving climate conditions and hazards in future years. For example, nature-based solutions need to use species that will thrive in a location’s future climate. Coastal projects in particular must seriously consider the potential for community relocation and, therefore, the investment’s likely true lifespan. This proves invaluable to

SPOTLIGHT: LAND USE PLANNING AND LAND-BASED FINANCING

An underlying tension and incompatibility exist between land-based local government finance and climate change adaptation. Despite clear evidence that waterfront development in coastal areas, flood plains, and other high-risk areas greatly exacerbates physical and fiscal exposure, many communities must maximize development simply to meet their budgets and compensate for tax base losses. “Under climate change, these strategies create a vicious cycle that paces ever more development in the floodplain, even as climate impacts erode infrastructure, tax revenues, and local capacity to fund services.”²⁶

The challenge: Aligning property values and insurance premiums with climate risks as reforms only hastens lost taxes. Also, the absence of enforceable regulations on local land use planning for hazard mitigation or climate adaptation makes retreat or development avoidance in risk-prone areas much less palatable politically. In essence, left unchanged, existing land use and fiscal policies provide an incentive for municipalities to make short-term decisions with accelerating climate risks over time. This creates dynamics of fiscal stress that can increase regional inequality and vulnerability to climate change.²⁶

Cities with more land and greater resources may be able to lobby for more state aid and squeeze more funds from the remaining area. Municipalities in weaker markets lack such options and often are forced to defer maintenance on infrastructure and trim services, and this further exacerbates exposure.

A need exists for a de-siloed approach that fosters research and dialogue among researchers and policymakers on the nexus between land use planning, municipal finance, government administration, and inequitable development.²⁶

an investment’s long-term viability and success.

Begin by creating a resilience agenda. Long-term project planning requires thinking about durability and flexibility to withstand changing climate conditions. This entails assessing long-term climate risk and planning for ongoing operations and maintenance costs.

Many policies exist to support this work. For additional ideas, consider [Characteristic 10](#).

3. Integrate resilience into planning across silos.

Integrate climate resilience across entities and agency siloes. This requires closely coordinating planning efforts across departments.

See, for example, [Characteristic 6](#) around intentional project bundling and [Characteristic 1](#) for cross-sector integration.

4. Connect with political planning and vision.

Connecting with local government planning and vision proves key to achieving long-term support and commitment, particularly from those who hold positions of power and may possess veto power. Private-sector interest also requires a high degree of certainty that projects will proceed and receive political reinforcement.

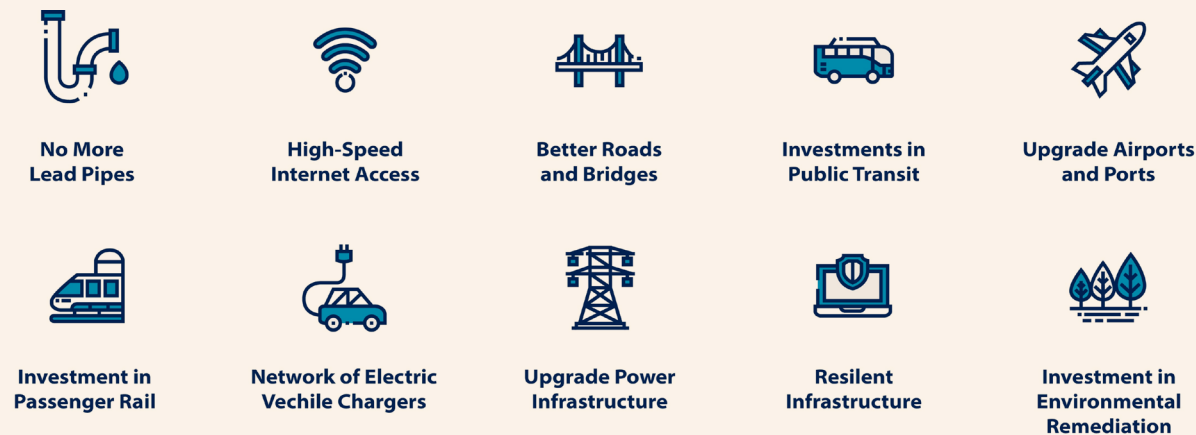
This means incorporating resilience into long-term infrastructure pipelines via bankable projects that are economically, socially and environmentally sustainable. These plans must have clear project outcomes, a timeline, and transparency.

5. Look beyond hazard mitigation planning (at least with key federal funding areas).

Consider the 2021 Infrastructure, Investment and Jobs Act (IIJA), for example. This federal funding category graphic (Figure 7) illustrates how IIJA funding is dispersed across sectors.²⁵ While there's a \$47 billion set aside for climate resilience specifically,

any of these sector investments can be accomplished in a manner that furthers climate resilience (or, alternatively, that perpetuates exposure). Bringing sustainability or climate action into decision-making likely indicates an opportunity to enable resilience as well. Local governments frequently have plans associated with each of the categories on the left. Consider opportunities to embed resilience criteria and principles into each.

Figure 7: Federal funding categories defined by the 2021 IIJA.



READY-TO-FUND RESOURCES

Partners and Capacity Support

Local government departments across sectors. Key partners in project planning, procurement, implementation, as well as long-term monitoring and maintenance.

Questions

How do municipal plans, both short- and long-term, reflect the community's resilience goals?

Resources

Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) was adopted on September 17, 2018, in fulfillment of Governor Baker's [Executive Order 569](#) on climate change. [This plan](#), the first of its kind to comprehensively integrate climate change impacts and adaptation strategies with hazard mitigation planning, also complies with current federal requirements for state hazard mitigation plans and maintains the Massachusetts Commonwealth's eligibility for federal disaster recovery and hazard mitigation funding under the Stafford Act. The plan received FEMA approval and is effective 9/19/2018 through 9/18/2023.

The United Nations office for Disaster Risk Reduction (UNDRR) offers several resources that can assist with resilience planning, including the [Scorecard for Cities](#). The Scorecard provides a set of assessments that allow local governments to assess their disaster resilience, structuring around UNDRR's Ten Essentials for Making Cities Resilient. It also helps to monitor and review progress and challenges in implementing the Sendai Framework for Disaster Risk Reduction: 2015–2030 and supports the baseline analysis for preparation of the disaster risk-reduction and resilience strategies. When considering risk, the [Quick Risk Estimation tool \(QRE\)](#) developed by UNDRR and Deloitte can be useful.

[Cities Advancing Climate Action: Leveraging Federal Funds for Local Impact](#), a resource guide prepared for by the Alliance for a Sustainable Future, is an inspiration and a practical guide for cities at the center of advancing climate and resilience priorities for communities that are in a position to make an even greater impact in their communities. With funding from the Infrastructure Investment and Jobs Act (IIJA), the Alliance for a Sustainable Future, a collaboration between The U.S. Conference of Mayors



Characteristic 9: Clearly connect to existing local government plans

SAMPLE ACTIONS

Short Term

Seek to bring climate resilience into conversations around municipal planning processes and documents.

Identify areas where climate resilience could be incorporated into existing plans and frameworks, or where it could be centered in future ones.

Longer Term

Establish a pipeline of climate resilience projects that align with the community resilience vision, embedding them in long-term plans wherever possible.

Ongoing

Engage community residents/organizations, business leaders, and partners to think outside the box for what holistic community resilience looks like. This can support comprehensive solutions that improve community well-being and living quality over temporary or reactive fixes.

(USCM) and the Center for Climate and Energy Solutions (C2ES), has developed a collection of case studies that highlight what cities can do now to preposition for funding, plan for co-leveraging diverse funds, and develop projects to capture maximum community benefits.

Example.

In 2021, Boston began updating its [Natural Hazard Mitigation Plan \(NHMP\)](#), a requirement for funding through the Federal Emergency Management Agency (FEMA). A steering committee of city leaders focused on the vulnerability and risks associated with natural hazards using past events to inform future planning. However, previous planning initiatives and studies of the city showed officials that [climate change could exacerbate the vulnerability and risks](#) of possible future hazards. Thus, in addition to data on historic events, climate change scenarios and estimates were considered for such issues as rising heat, increased precipitation and flooding, and sea level rise and coastal surge. The list of the city's hazard mitigation recommendations included certain climate adaptation solutions, such as energy resilience measures and raised building features along the coast. In addition to a more holistically developed plan for protecting residents, incorporation of climate adaptation into the NHMP also opened the doorway to more funding sources beyond FEMA grants, including Massachusetts' [Municipal Vulnerability Preparedness](#) grant program.

Enabling Regulatory Framework and Policy



Characteristic 10: Benefit from policies that incentivize climate resilience action

What.

Ready-to-Fund Resilience Projects benefit from policies that incentivize or mandate equitable climate resilience investment, such as standards and codes that enforce climate resilience criteria, mandatory risk assessments, or tax incentives for investments that prioritize LMI and BIPOC communities.

Why.

Embedding resilience into local government policies and adjusting existing and creating new policies to support the climate resilience agenda can:

- Increase certainty for investors.
- Reduce transaction costs.
- Incentivize resilience.
- Mitigate risk and avoid losses.
- Enhance transparency.
- Set a framework for data collection and ongoing monitoring and maintenance.
- Mandate best practice.
- Increase eligibility for funding.
- Unlock additional funding streams.
- Increase local government creditworthiness and, therefore, fundability.
- Ensure more equitable outcomes
- Improve efficiency.



SPOTLIGHT: RISK MITIGATION VIA PRIVATE SECTOR INVOLVEMENT

Risk sharing with the private sector is an undervalued and underused risk mitigation strategy. It provides alternative sources of financing and public/private partners can provide a much-needed risk transfer. Under it, risk retained by the Government in owning and operating infrastructure that, typically, carries substantial and often unvalued costs is allocated partially to a private party that can better manage it. This can reduce the project's overall cost to the government.²⁵ In effect, if the same private-sector risk taker is in charge of the project's delivery and operation, the private partner can provide the robust risk management processes in the planning and structuring phase and then apply and develop those processes throughout the project's life.

The public and private sectors think differently about risk. Local government resilience leaders, needing to cope with budget constraints and other factors, may have difficulty centralizing risk in project considerations. When risks do emerge, they typically do not trigger major fiscal consequences. Governments seldom face liquidity problems, and the failure of a single project typically will not affect a government's credit rating. However, climate-specific risks trigger a new dimension of risk. In contrast to construction delays and cost overruns, benefits take longer to appear, may face significant and continuous disruption, and may never appear.³²

In the private sector, by contrast, construction and commercial risks can have massive financial consequences. A 10% cost overrun can mean the company no longer earns profit on a specific initiative, or could even bankrupt an organization. Consequently, the private sector has become experts of risk management across a project's lifecycle. The private sector doesn't just assume risk; it actively manages it, prices it, and determines the compensation required to take it on.

How.

1. Bake risks into institutional framework and policies.

The more robust and structured a regulatory framework and the more efficiently it is enforced by independent regulators, the greater the likelihood that prospective investors will help fund projects. By nature, climate resilience decisions are forward-thinking and seek to improve the long-term performance and well-being of communities. To be accountable to this goal, consider extending the lifecycle of an asset and increasing the timeframe over which projects are tracked. It proves important to ensure that short-term problems don't take precedence over longer-term, goal-oriented actions

Risk Mitigation Strategies can be found in [Table 9](#) on page 100.

2. Establish equitable resilience standards and incentives.

Standards and codes are critical for state infrastructure, buildings, and utilities

When involved in public resilience projects from the outset, the private sector considers all risks, including climate risks, construction risks, and commercial risks after completion, among others. In addition to the baseline costs required to deliver a project, the developer adds a risk premium to cover the additional measures and activities required to mitigate and manage these risks.³² Along with supporting predictability, transparency, whole-of-life management, cost savings and accountability, government payments are conditional on the private party providing the specified outputs at the agreed quality, quantity, and timeframe. If performance requirements are not met, service payments may be abated.³²

At the ideal level, the private sector provides risk management skills and benefits from the public sector's ability to take a long-term view and interest and absorb other risks without the fear of bankruptcy.



mendation of the White House Hurricane Sandy Rebuilding Task Force signals that adopting and enforcing model building codes proves to be among the most effective things states can do to drive climate resilience.²⁷

Incorporating climate adaptation and resilience standards into existing funding streams could ensure that all projects and programs account for climate risks and include adaptive components. In many cases, this approach will be easier to execute than creating new funding streams that require broad administrative, political, and public support. Adapting the standards of existing funding tools to include clear, measurable, and consistent criteria for evaluating and comparing project risks could help reduce the burden of understanding the vulnerabilities of projects to climate risks. It also could direct existing resources to support projects that minimize climate change

as well as for regulatory mechanisms to build climate resilience on private property. Establishing standards also enhances eligibility for federal funding. For instance, FEMA's Building Resilient Infrastructure for Communities grant program awards significant points to states with such elements as a state building code in place. In addition, municipalities can employ design standards and best practices for materials procurement and use, asset management, construction, bridge management systems, safety, etc. A primary recom-

READY-TO-FUND RESOURCES

Partners and Capacity Support

Local government practitioners, organizations that support municipal policy, state and federal agencies with power and influence over resilience funding and finance and associated policy, institutional investors, cross-sector government agencies, local think tanks and economic institutions, states and national data providers, etc.

Questions

How is everyday decision-making based on public policy supporting equitable resilience funding and finance? How can risk be mitigated to attract greater investment in equitable climate resilience? Are the conditions and processes in place for investors to assess the resilience of investments? What policies are preventing resilience investments?

exposure, and to limit the need for future costly interventions that may be required when climate change exposure is not considered.²⁷

Establishing incentives has significant spillover effects: offering incentives for contractors and service providers to develop skills and expertise around resiliency. It makes it easier and more cost-effective for others—local governments or private companies—to demand similar standards.

3. Support Structural Shifts

Ultimately, local governments are limited in their ability to seek transformational change. Many challenging practices and policies that may inhibit climate resilience momentum stem from top-down practice. The above included many strategies to better operate within existing policy structures. However, resilience leaders and technical assistance providers, especially as a collective, hold power to structurally influence the policy environment itself. By partnering with advocacy groups and elected officials, resilience leaders can lobby for better state or federal policy. See Characteristics 1 and 2 for additional details around coalition-building.

Resources

Several examples of policy levers for local governments to better incentivize and support equitable climate resilience investment are included in [Table 8](#) (page 99).

TABLE 8: ILLUSTRATIVE POLICY LEVERS

| Establishing Criteria for Equitable Climate Resilience | Baking Climate Risk into Institutional Frameworks | Standardizing Climate Resilience Investment Processes | Supporting Innovation |
|--|--|--|---|
| <p>Illustrative Policy Levers</p> <ul style="list-style-type: none"> • Climate resilience measures integrated into program spending and evaluation criteria. • Resilience criteria incorporated into public/private partnership RFPs. This has a positive but indirect effect because even when governments assume the full cost of a project, they often rely on private capital for debt (municipal bonds). This direction signals to investors that demand exists for resilient infrastructure and it's in their interest to learn how to evaluate it. Moreover, contractors, architects, and project managers will have to develop resilience-related capabilities to win public contracts.²⁸ • Incentives and standards for prioritizing investment in LMI and BIPOC communities. • Integration of resilience requirements and design principles into all infrastructure-related policies, programs, and investment decisions. • Increased market incentives (such as insurance discounts) for projects that increase resilience. • Tax or credit incentives for projects that prioritize lower-income and BIPOC communities. | <p>Illustrative Policy Levers</p> <ul style="list-style-type: none"> • Mandatory risk assessments. • Integration of the changing climate into land use planning and other decision-making, and considering climate impacts that gravely impact communities, particularly those historically marginalized by land use decisions. For infrastructure, this means incorporating climate risk considerations across the entire asset lifecycle. • Adoption of disclosure requirements that steer investors toward projects and institutions exposed to less climate (and thus financial) risk. • Clarified public/private risk allocations, codified through legally enforceable contracts. • Introduction of climate risk considerations into disclosure requirements and fiduciary responsibility standards. • Expansion of access to price guarantees in resiliency benefits to help overcome the policy sensitivity of these investments, reducing risk for private investors. • Encouraging banks to set aside a certain proportion of existing guarantees for projects that meet sustainability criteria to boost investment of private capital. | <p>Illustrative Policy Levers</p> <ul style="list-style-type: none"> • Standardized procurement and contractual processes that include climate resilience to minimize transaction costs for the private and government sectors, but with sufficient flexibility built in for project/sector-specific requirements. • Objective, robust local government governance procedures and vehicles to serve as a focal point for investors to partner with. • Policy platforms to enable cooperation among developers, investors, and regulators. • Standardize bidding and procurement processes. • Development of clear and consistent investment regulations and policies. • A strong institutional framework that clearly articulates roles and distinct responsibilities between the public and private sectors. • Build capacity to advance project development in a more streamlined and cohesive manner. | <p>Illustrative Policy Levers</p> <ul style="list-style-type: none"> • Establish common legal and design standards that can reduce costs and make doing business easier. • Policy approvals of innovative financing mechanisms and models. |

Table 8 (above): Illustrative Policy Levers.

A key action opportunity in this space is the simultaneous implementation of risk-reduction measures. [Table 9](#) (page 100) outlines opportunities for local governments to do so. The Task Force on Climate Related Financial Disclosure is compelling some investors to account for risk even in the absence of regulation.

Table 9 (next page): Risk Management Mechanisms.

TABLE 9: RISK MANAGEMENT MECHANISMS

| Green Bonds and Yieldcos | Adapting Financing Models | Guarantees | Syndication Loans | Insurance Pooling |
|--|---|---|--|---|
| <p>Instruments such as green bonds and yieldcos use common financial instruments that give investors a sense of familiarity and, thus, security to enhance capital flows to resilient infrastructure. Investors view green bonds as an increasingly common type of revenue bond and a good way to achieve market-competitive returns while incorporating climate change as part of their institutional missions. Yieldcos (most commonly associated with renewable energy projects) are publicly traded companies created by a parent company that bundle operating infrastructure assets to generate predictable cash flows that are then paid out in shareholder dividends.</p> <p>Green bonds and yieldcos can reduce risks associated with infrastructure investments. For instance, the credit risk associated with green bonds is typically lower than that of similar project bonds because the risk is assumed by the issuing entity and not by the cash flows from the individual project. Yieldcos, or a ‘yield’ company formed to own operating assets and raise funds by issuing shares to investors, reduce risk by pooling projects, which helps institutions diversify their investments.</p> | <p>Another option is to adapt existing funding models to seek innovative risk-transferring mechanisms while operating within a framework familiar to investors. “Land value capture,” for example, is used to finance railways, metros, and highways. This model seeks to capture the additional value created by infrastructure through impact fees, special assessment districts, or tax-increment financing. This allows infrastructure to be financed based on its ability to raise the value of the surrounding land once built. Similar models could be designed for resilient infrastructure, if it made a community safer from flooding and increased property values. This value, for instance, could be leveraged to finance the up-front project investment.²⁹</p> <p>Over the long run, the more experience institutional investors gain with resilient projects, the more comfortable they will be and more likely to allocate more of their portfolios to resilient infrastructure.²⁹</p> | <p>Guarantee: A commitment signed with a financial institution (bank, insurance company, city, etc.) that “covers the beneficiary in case of default or breach of a contractual obligation.”³⁰</p> <p>So long as climate risk is baked into project planning and implementation considerations, guarantees provide an effective way to “crowd in” private finance and leverage multiples of private capital for every dollar spent.²⁸ Guarantees make it possible for risk-averse investors to participate in a project they might otherwise avoid. As investors see that the real risk profile is lower than they believed, guarantees would no longer be required.</p> <p>Increasing use of guarantees can be achieved in numerous ways, although a primary strategy involves differential pricing. While policy risk could be higher, resilient infrastructure should be less vulnerable to climate risk than traditional infrastructure, lowering an investment’s long-term risk profile. Therefore, some guarantees for resilient infrastructure could be priced lower than those for traditional infrastructure. Differential pricing also could provide an incentive to the private sector to invest in resilient infrastructure, particularly if backed by guarantees. Increasing guarantees is relatively simple in terms of policy and execution. It involves scaling up existing capabilities. Stakeholder coordination also is straightforward because it only requires banks to modify what they are doing and place a greater emphasis on resilient infrastructure. However, in many cases, governments also must agree to provide a counter-guarantee, something they may be unwilling to do. Also, there may be an insufficient number of projects that want guarantees or that meet development banks’ requirements.</p> | <p>Syndicated loan: “Financing offered by a group of lenders—referred to as a syndicate—who work together to provide funds for a single borrower. The borrower can be a corporation, a large project, or a sovereign government. The loan can involve a fixed amount of funds, a credit line, or a combination of the two.”³¹</p> <p>Using a syndication can create a larger secondary market for resilient infrastructure-related securities. Loan syndication enables lenders to recycle their capital or more resilient infrastructure investment, increasing the projects financed. This would boost institutional investor familiarity with the asset class, reduce transaction costs, and allow the recycling of capital. Loan syndication also reduces transaction costs. This is particularly helpful for smaller projects and those that require a premium or that include new technologies. By providing a lower-risk, lower-cost way to participate, syndication gets the private sector involved, building its confidence and willingness to invest.³¹</p> | <p>A ‘risk pool’ is a form of risk management mostly practiced by insurance companies. They unite to form a pool to provide protection against such catastrophic risks as floods or hurricanes. Take wind pools, for example. Coastal wind insurance pools in the U.S. are chartered by states to provide property insurance to residents and businesses that cannot secure private insurance with sufficient coverage at rates considered affordable. Some “wind pools” cover only wind losses, while others offer a multi-peril policy. Indeed, multiple pools can coexist in the same state. Rates vary by pool, region, and policy type, and they often are below actuarially sound levels. Wind pools in states along the Atlantic Coast have grown in recent years—sometimes dramatically—yet few have enough capital (either retained or by way of reinsurance) to satisfy their potential obligations. Risk pools in the form of parametric insurance are being improved to include natural resource conservation, such as coral reefs.</p> |



Characteristic 10: Benefit from policies that incentivize climate resilience action

SAMPLE ACTIONS

Short Term

Consult local banks, local government financial officers, and other local finance experts to explore risk mitigation opportunities including syndication loans, guarantees, green bonds, yieldcos, and more.

Longer Term

Establish equitable resilience standards and incentives.

Ongoing

Analyze whether the regulatory, legislative, and policy regime in place inspires investor confidence in project feasibility and viability.

Act to ensure the city has a credit rating high enough to attract financing from capital markets, and the capacity to plan large capital projects, currency risk, and interest rate volatility. See [Characteristic 2: Municipality Creditworthiness and the Hidden Cost of Inaction](#) for additional insights.

Example.

Like many other U.S. cities, Los Angeles faces a heat problem. Exacerbated by asphalt and other building materials, heat within the city led to [increasing heat stroke deaths from 2014–2018](#).

The city had tried to enact various climate resilience measures, such as a [Cool Roofs Ordinance](#) in 2014 and a “[Save Energy LA](#)” campaign in 2016. However, the city in 2018 added an ambitious five-year insulation rebate program to counter this problem. The Los Angeles Department of Water and Power would provide homeowners between 20–30 cents per square foot of roofing [retrofitted to cooler roofing materials](#). Not only would this decrease surrounding temperatures during hot days, cooler roofs would reduce use of air conditioning [consumption as well as airborne pollutants](#). This incentive program encouraged tens of thousands of residents and building developers to convert their roofs. Through these cooler roofs, more than 3.6 GWh/yr has been saved in energy consumption, and heat-related deaths declined nearly in half in 2019 from 2018.



Appendices

Photo: Solar panels in the city.
Credit: Fuyu Liu

Appendix A: Financing Mechanisms

Local governments have access to many funding mechanisms³³ to further resilience progress. To supplement federal, state, philanthropic and institutional grants, these are several mechanisms available to leverage debt, seek innovative sources of revenue, engage the private sector, and mitigate risk.

Leverage Debt to Grow Funding and Finance

General Obligation Bonds: A common municipal bond structure issued by a local government (secured by an income or carbon tax) to finance major infrastructure and other resilience investments that provide long-term public benefits. Bonds are sold to investors by municipalities (or states) and secured by the available revenue streams (taxes). Low transaction costs, relatively well understood, does not require new legislation.

Revenue Bonds: Similar to general obligation bonds except the revenue source backing the bond and paying the debt service is the project being financed. For example, a highway can be financed with a revenue bond if tolls collected are used as debt service.

Green Bonds: Loan for a fixed period of time that goes toward environmental projects and is often associated with tax incentives. Traditionally, they are very infrastructure-centric and less useful to further more holistic, human-centric resilience efforts. They have been used to raise capital for specific clean power, carbon-reducing projects. However, green bonds increasingly are used to finance non-carbon projects, including stormwater management, transportation, land use projects, and waste management, among others. More appealing than bank loans, they offer longer maturity periods, third-party credit enhancement and more flexible covenants. When issued by government entities, they are tax-exempt.

Resilience Bonds: An experimental finance mechanism not yet in the marketplace, they are a variation of catastrophe bonds that link insurance and resilience projects to monetize avoided losses (reduction of insurance claims). The resulting risk-reduction “resilience rebates” can be a source of predictable funding for insurance policyholders to invest in as a means to finance resilience projects.

Catastrophe Bonds: Catastrophe bonds provide a means to manage financial risk associated with extreme natural disasters. Essentially, they are a form of insurance and trigger when disaster strikes. When a disaster (hurricane, storm surge, flood, earthquake, etc.) reaches a given threshold within the bond term of 3–5 years typically, the insurance purchaser keeps a certain amount of the bond to pay off losses and investors lose some or all of their investment. They prove attractive to investors because they are not associated with other financial risks and provide attractive rates of return. They become more valuable investments when the estimate of financial loss from a natural hazard shrinks. They are used regularly by government-sponsored insurance programs, including the California Earthquake Authority, Florida Citizens Property Insurance, Louisiana Citizens Insurance, Amtrak, and the Texas Windstorm Insurance Association.

Tax Incremental Financing: Tax Increment Financing (TIF) is a method of financing a project or development in a designated geographic area and based on the anticipated increase in property tax generated by the project. TIFs offer a promising mechanism to promote investment in climate resilience and nature-based solutions so long as the property costs are not borne by LMI or BIPOC residents or property owners and improvements do not displace local businesses and residents.³³

Generate Revenue Specifically for Resilience

Utility Rates: A traditional approach to generating revenue that taps utility revenues by adjusting rates. Use of these funds is restricted to actions consistent with the utility’s purpose. With electric utilities, this can be done through rate-setting by state regulators. Stormwater utilities around the U.S. have been raising rates to pay for flood-prevention improvements. An advantage of using bonds and utility rates is that they spread the costs across very large numbers of payers, which allows the increases to be minimized. But this spread also means the benefits of resilience building that may be realized are not tied to the costs that one will pay.

Insurance Surcharges: A state or regional trust fund, capitalized via a surcharge on certain lines of insurance (such as property, casualty, for example) can offer an additional pool of funding for resilience funding and finance. Insurance surcharges offer an opportunity to establish a dedicated funding source that crosses jurisdictions but also take advantage of bond leverage.³⁴ This is a progressive strategy because higher-income people insure more expensive items.³⁵

Goldman Sachs has conducted similar work on insurance surcharges through its investment banking division. It found that premiums for property, casualty, and title insurance in New York State totaled roughly \$47 billion in 2017, and a 2% surcharge would raise about \$950 million annually. From a consumer’s standpoint, homeowners would pay a \$26 annual surcharge on an average homeowner’s insurance bill of \$1,302 and a \$24 annual surcharge on the average car insurance bill of \$1,224.³⁴

Carbon Pricing: The energy sector is another potential target. California invests in resilience with funds obtained from the carbon-pricing market it uses to reduce carbon emissions. In 2019, the state's cap-and-trade auctions generated more than \$2 billion appropriated by the legislature. Investments included \$2 million for coastal resilience planning, \$10 million for community fire planning and preparedness, \$85 million for fire prevention, \$100 million for resilience-related drinking water systems, and \$2 million for resilience planning in the San Francisco Bay area.

Dedicated Tax Revenue: Funding can be sourced from property taxes, sales taxes, resilience special districts, or tax increment financing. The Georgia Outdoor Stewardship Act became effective in July 2019.²⁴ It dedicates a portion of existing sales and use taxes on outdoor sporting goods to support clean water and land acquisition projects that increase resilience across the state. The Trust for Public Land partnered with state and local leaders to design and pass the conservation ballot measure.¹⁰

Tourism and Recreation Fees: Revenue collected by assessing small fees for voluntary programs, such as paying for parking tickets online, registering for recreation programs, creating a property tax account, etc. Municipalities can use fees to increase revenue available for sustainability- and resilience-focused projects.

Explore and Incentivize Private Investment

Environmental/ Social Impact Bonds: Pay-for-success approach that transfers risk. Performance-based contract that is privately financed. Financiers are paid back by a public entity if pre-established metrics are met.

Public Private Partnerships: Designed to leverage additional capacity and financing for delivery of infrastructure projects while also increasing stakeholder engagement in project delivery. Can be used to bring private expertise and capital to the design, financing, construction, operation and/maintenance of a publicly owned asset. Regional example: Chesapeake Bay Watershed CBP3. Many require enabling legislation.

Trading schemes: Includes offsets in which developers can manage stormwater on another property to meet regulations or trading; developers or agencies can purchase credits on a market. Private funding, private property.

Infrastructure Bank: Used to coordinate infrastructure development and investment during recovery and beyond. Serves to centralize a state's infrastructure planning to maximize funding efficiency rather than making funding decisions on a project-by-project basis. The bank combines federal disaster relief funds and state funds and can leverage those funds to encourage private investments to finance resiliency improvements to the state's infrastructure.

Incentivize Action and Mitigate Risk

Insurance of Tax Incentives:Used to lower premiums for resilience-building or exclude qualified disaster mitigation payments from taxable income. “Qualified disaster mitigation payment” is any amount paid under the Stafford Act or the National Flood Insurance Act (NFIA) to a property owner for hazard mitigation for the property. An opportunity exists to expand this definition to include more holistic project goals (not just avoided property damage from disaster) by creating “resilience retrofit tax credits,” which are state tax credits that could trigger federal tax relief as well as incentivize policy change. Consider the Department of Energy’s Database of state incentives for Renewables and Efficiency

Insurance Pooling:Through catastrophe risk pools, sectors and regions can pool risk in a diversified portfolio, retain some of the risk through joint reserve and capital, and transfer excess risk to the reinsurance and capital markets. Since it is unlikely that all regions will suffer a major disaster within the same year, the diversification creates a more stable and less capital-intensive portfolio that is cheaper to insure. Insurance pools by sector exist throughout the U.S. for wind damage, wildfire, and agriculture.

Appendix B: Discounting Alternatives

Cost benefits analysis takes the payback period of a project into account by applying a standard discount rate to the costs and benefits over the analysis period. This converts project cost and benefits accrued many years ahead into a ‘net present value.’ The further into the future the benefit or cost occurs, the lower the weight attached to it. The challenge is that in doing so, accounting appears to make the long-term benefits of resilience projects disappear, causing the upfront costs to dominate the cost-benefit ratio and make climate resilience projects seem artificially unfavorable. So long as traditional discounting practices are used, a bias will always exist in that direction.

Discounting Opportunities

Time-declining discount rates (DDR): These are an innovative discounting strategy for discounting but make future benefits more relevant to current investors and policymakers. Basically, the discount rate used is not fixed; the discount rate used to account for costs or benefits 25 years down the line is lower than the discount rate used for cost and benefits in five years from project completion. Essentially, DDRs can be used to give greater weight to project outcomes that may not be realized for years after project completion (namely social and environmental co-benefits). In the context of resilience projects, opting to use DDRs may result in a more favorable cost benefit ratio that can help better make the case for their implementation.³⁶

Social Discount Rates (SDR): Investments that cascade social and environmental benefits into communities can be eligible for social discount rates that typically are lower than financial discount rates and make future benefits more relevant to the present-day investor. SDRs for climate change have been suggested in the range of 1% to 6%.³⁷ For context, traditional discount rates for investments generally range between 7.5% and 9.5%.³⁸

Appendix C: January 2022 Federal Resilience Funding Sources

Climate Finance Advisors, BLLC (CFA) tracks federal funds useful for actors at various jurisdictional levels (states, local governments, tribes, etc.). The figure to the right is a snapshot as of September 29, 2021, which draws upon work conducted and prepared under the [EU-USCA Climate Risk and Resilience Cooperation](#) supported by the European Union and the U.S. Climate Alliance. It also draws from the [Connecticut Financing and Funding Adaptation and Resilience Working Group](#) report appendix of federal funding resources.

An [updated snapshot as of January 2022](#) can be found on the [Ready-to-Fund Resilience Toolkit](#).

| Funding Mechanism or Program Name | Brief Description | Administering Body | Funding Range | Required Match % (0-100) | Link to Overview |
|--|--|--------------------|--|--|---|
| Building Resilient Infrastructure and Communities (BRIC) | <p>Building Resilient Infrastructure and Communities (BRIC) supports states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards.</p> <p>The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.</p> | FEMA | <p>Up to 6% annual set aside from post disaster grant funding. State, territory and tribal set-asides and national competition for balance, large and small grants. \$919M expected in FY21, up from \$500M in round 1 (FY20). Up to \$1M award per applicant for capability and capacity-building efforts and \$500k for mitigation-related activities.</p> <p>https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities/before-apply</p> | 10% to 25% | https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities |
| Flood Mitigation Assistance (FMA) | <p>The Flood Mitigation Assistance Program is a competitive grant program that provides funding to states, local communities, federally recognized tribes and territories. Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program.</p> | FEMA | <p>\$160 million total in FY21, \$4 million for Project Scoping or \$600,000 for Sub-applicant for Community scale projects and relocations \$70 million for Community Flood Mitigation Projects (\$30 million per project cap) \$86 million for Technical Assistance, Flood Hazard Mitigation Planning and Individual Flood Mitigation Projects. Up to \$1M per applicant.</p> <p>https://www.fema.gov/fact-sheet/notice-funding-opportunity-fiscal-year-2021-building-resilient-infrastructure-and</p> | 0%-Severe Repetitive Loss 10%-Repetitive Loss 25%-Hazard Mitigation Assistance | https://www.fema.gov/grants/mitigation/floods |

Figure: January 2022 snapshot of federal resilience funding sources, provided by CFA BLLC.

Appendix D: Characteristics of Potential Partners and Lead Institutions

Based on the Resources Legacy Fund guidance on [Paying for Climate Adaptation in California](#):²

| INSTITUTION | FINANCING TOOL | WHEN TO INVOLVE | KEY BENEFITS | KEY DRAWBACKS |
|---|--|---|--|---|
| Nonprofit/Educational | | | | |
| Academics and Research | <ul style="list-style-type: none"> • Grants | <ul style="list-style-type: none"> • Evaluation of costs and benefits • Recommendations for new technologies • Post-completion monitoring and evaluation | <ul style="list-style-type: none"> • Can access research grants that fund data collection and analysis • Independent oversight | <ul style="list-style-type: none"> • Limited in funding capacity |
| Community Development Corporation | <ul style="list-style-type: none"> • Grants • Donations • Loans | <ul style="list-style-type: none"> • Community-oriented developments and services including affordable housing, Job training programs | <ul style="list-style-type: none"> • Continual involvement in community | <ul style="list-style-type: none"> • Limited in funding capacity |
| Community Development Financial Institutions | <ul style="list-style-type: none"> • Grants • Donations • Loans | <ul style="list-style-type: none"> • Predevelopment • Bridge financing Workforce development | <ul style="list-style-type: none"> • Can offer smaller and less burdensome loans to communities that cannot access larger funding opportunities | <ul style="list-style-type: none"> • Limited in funding capacity |
| Community Land Trusts | <ul style="list-style-type: none"> • Grants • Donations | <ul style="list-style-type: none"> • Community-oriented developments including • affordable housing and recreational space | <ul style="list-style-type: none"> • Continual involvement in community and long-term affordability mission | <ul style="list-style-type: none"> • Limited in involvement • May be limited in funding capacity • Resource-intensive to establish |
| Think Tanks | <ul style="list-style-type: none"> • Grants • Donations | <ul style="list-style-type: none"> • Community engagement in planning and oversight processes • Performance evaluations Support revenue generation efforts (e.g., ballot initiatives) | <ul style="list-style-type: none"> • Can access private donations and membership fees • Can provide space for community engagement and debate • Independent oversight | <ul style="list-style-type: none"> • Limited in funding capacity |

| INSTITUTION | FINANCING TOOL | WHEN TO INVOLVE | KEY BENEFITS | KEY DRAWBACKS |
|---------------------------------|--|---|---|---|
| Public Sector | | | | |
| Federal | <ul style="list-style-type: none"> • Funding/Financing Tool • Grants • Donations • Loans • Bonds • Taxes | <ul style="list-style-type: none"> • Can fund major infrastructure projects with long timeframes | <ul style="list-style-type: none"> • Can levy taxes • Oriented towards provision of public goods. Access to low-cost financing | <ul style="list-style-type: none"> • Constitutional limitations on taxing power • Changing administrations can affect funding priorities |
| State | <ul style="list-style-type: none"> • Bonds • Grants • General and special taxes • Fees | <ul style="list-style-type: none"> • Can fund major infrastructure projects with long timeframes | <ul style="list-style-type: none"> • Can levy taxes • Oriented towards provision of public goods. Access to low-cost financing | <ul style="list-style-type: none"> • Changing administrations can affect funding priorities |
| TIF District | <ul style="list-style-type: none"> • Tax-increment financing (future property value increases) | <ul style="list-style-type: none"> • Projects located in areas with increased development potential | <ul style="list-style-type: none"> • TIF formation may not require voter approval | <ul style="list-style-type: none"> • Issuance of TIF bond requires 55% voter approval in district Requires redirecting future property tax revenue. Dependent on anticipated increases in value. |
| Publicly-Owned Utilities | <ul style="list-style-type: none"> • User fees • Bonds | <ul style="list-style-type: none"> • Utility infrastructure. • Vulnerable shoreline assets. | <ul style="list-style-type: none"> • Access to tax-free bonds. • Rates can be raised for water, sewer, and stormwater unless a majority protest. • Gas and electric rates are set by district's elected governing board in a public forum. | <ul style="list-style-type: none"> • High administrative capacity required to form a POU if not already established |
| Special Districts | <ul style="list-style-type: none"> • Public Private Partnerships • Bonds • Special taxes • Assessments • Service fees | <ul style="list-style-type: none"> • Assessments, service fees • User fees, taxes • Additional or enhanced public services | <ul style="list-style-type: none"> • A government entity with authority to issue bonds and levy special taxes • Can establish a Communities Facility District | <ul style="list-style-type: none"> • Require continual overhead funding. • Subject to the same voter approval laws as Counties and Cities. • Cannot levy general taxes. |

| INSTITUTION | FINANCING TOOL | WHEN TO INVOLVE | KEY BENEFITS | KEY DRAWBACKS |
|------------------------------------|---|---|--|--|
| Private Involvement | | | | |
| Public Private Partnerships | <ul style="list-style-type: none"> • User fees • Taxes • Risk management | <ul style="list-style-type: none"> • Involve as early as possible • Risk can be effectively transferred • Outcomes can be quantified | <ul style="list-style-type: none"> • Can sometimes offer cheaper cost service delivery • Access to private capital / avoidance of public debt | <ul style="list-style-type: none"> • Complex to structure • High transaction costs • Equity concerns • Cost savings to ratepayers not guaranteed |
| Investor-Owned Utilities | <ul style="list-style-type: none"> • User fees | <ul style="list-style-type: none"> • Utility infrastructure • Vulnerable shoreline assets | <ul style="list-style-type: none"> • High discretion over rate setting • Can establish tiered rate structures / lifeline rates High engineering capacity • Long-range capital planning horizons | <ul style="list-style-type: none"> • Rates subject to CPUC approval |
| Insurance | <ul style="list-style-type: none"> • Insurance surcharges • Insurance pooling | <ul style="list-style-type: none"> • Early: via risk officer, when assessing risk (using insurance data as feasible); via finance innovation team when investigating parametric options. | <ul style="list-style-type: none"> • Risk transfer | <ul style="list-style-type: none"> • Local government's insurance company point of contact may not yet be familiar with climate risk. Local governments traditionally have relied on rainy day funds, not risk transfer, and may not have innovative insurance relationships. |
| Institutional Investors | <ul style="list-style-type: none"> • Grants • Loans • Bonds | <ul style="list-style-type: none"> • Involve as early as possible to ensure alignment with eligibility criteria. | <ul style="list-style-type: none"> • Enhanced market efficiency. • Additional capital source | <ul style="list-style-type: none"> • Most evaluate potential investments on market return, not social or environmental good. Even social impact investors require returns on investment that may be beyond the capacity of a public service. |

Appendix E: Glossary of Key Terms

Adaptive Capacity: The ability of an individual, asset, or system to adjust to a hazard, take advantage of new opportunities, or cope with change.

This program helped increase the adaptive capacity of the people in the neighborhood.

Bankable: Projects that possess an attractive economic profile that appears likely to deliver high enough risk-adjusted returns to attract private sector equity or debt. Often, bankable projects refer to projects that incorporate some form of revenue generation—taxes or fees. However, projects can be made bankable through incentives, and by demonstrating how risks have been mitigated, significant cost avoidance and additional (sometimes indirect) environmental, social, and/or economic benefits will occur. Example: *In a bankable project, returns, costs, and risks are allocated appropriately between the government and private sector.*

Climate Change: Changes in average weather conditions that persist over multiple decades or longer. Climate change encompasses both increases and decreases in temperature, as well as shifts in precipitation, changing risk of certain types of severe weather events, and changes to other features of the climate system. Example: *Climate change is contributing to increased precipitation in the county.*

Climate Change Adaptation: In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. Example: *In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate.*

Climate Impacts: Effects on natural and human systems that result from hazards. Example: *The climate impacts on marine environments are becoming increasingly severe.*

Climate Change Mitigation: Processes that can reduce the amount and speed of future climate change by reducing emissions of heat-trapping gasses or removing them from the atmosphere. Example: *The state's climate change mitigation efforts include incentives to switch to forms of energy that emit fewer greenhouse gasses.*

Climate-Related Hazards: A condition or event produced or exacerbated by climate variability or change that may cause harm.

Climate Resilience: Climate resilience is the ability of communities to anticipate, accommodate and adapt positively to or thrive amid changing climate conditions or hazard events, and also to enhance quality of life, reliable systems, economic vitality, and conservation of resources for present and future generations. Resilience differs by facility, community, and setting.

Community Development Banks (CDB) or Community Development Financial Institution (CDFI): A development bank or credit union that focuses on serving people who have been locked out of the traditional financial systems such as the unbanked or underbanked in deprived local communities. Example: *Community Development Financial Institutions are working to strengthen communities by expanding access to capital.*

Decision-Making: The process of purposely choosing one course of action from a set of alternatives to advance personal or organizational goals. Example: *The land managers were able to engage in better decision-making after they started using higher quality data from the new sensors.*

Developer Equity: A developer's contributions toward project financing in terms of cash or land. Example: *Developer equity finance is a form of debt funding.*

Equity: Giving front-line and marginalized communities an explicit voice in [or input to) processes, and re-apportioning or redistributing resources so individuals can access opportunities. Example: *They increased equity by creating a new tier of conference rates available to people with lower incomes.*

Exposure: The presence of people, assets, or ecosystems in places where they could be adversely affected by hazards. Example: *Homes and businesses along low-lying coasts are exposed to coastal flooding from storms.*

Individuals and Communities on the Front Lines of Climate Change: People and communities on the front lines of climate change experience the consequences of climate change first and worst. They include people who are both highly exposed to climate risks because of the places they live and because they have fewer resources, capacity, safety nets, or political power to respond to those risks. This reflects widespread discrimination. They include BIPOC individuals and those with low incomes or from low-income backgrounds. They also include immigrants, those at-risk of displacement, old and young people, people experiencing homelessness, outdoor workers, incarcerated people, renters, people with disabilities, and chronically ill or hospitalized people.

Justice: Equal access to rights, resources, opportunities, and power. Achieving justice involves dismantling systems of oppression and privilege that create systemic disadvantages and barriers for certain individuals and groups. Example: *Their work to pursue justice begins by recognizing the historical events and conditions that have caused the community to be oppressed.*

Knowledge Co-Creation: People from different departments, backgrounds, or disciplines joining efforts to learn something new.

Maladaptation: Action taken ostensibly to avoid or reduce vulnerability to climate change that impacts adversely on, or increases the vulnerability of other systems, sectors or social groups

Mitigation: Processes that can reduce the amount and speed of future climate change by reducing emissions of heat-trapping gasses or removing them from the atmosphere. Example: *The state's climate change mitigation efforts include incentives to switch to forms of energy that emit fewer greenhouse gasses.*

Risk: The potential for consequences where something of value is at stake and the outcome is uncertain. Risk is often evaluated as the probability of a hazard occurring multiplied by the consequence that would result if it did occur. Example: *Sea-level rise and increased development increase the risk of coastal property damage.*

Sensitivity: The degree to which a system, population, or resource is or might be affected by hazards. Example: *The yield of crops with a high sensitivity may be reduced in response to a change in daily minimum temperature during the pollination season.*

Systems Thinking: A holistic approach to analysis that requires the capacity to solve problems at a complex, systems-level scale where many interrelated and interdependent parts interact within the whole system. Systems thinking requires the ability to understand system structure, recognize interconnections, identify feedback loops, understand non-linear relationships and adjust to dynamic conditions and behavior. Example: *By using systems thinking, the local government anticipated that raising public transportation fees to cover the infrastructure upgrades necessary to adapt to increased flooding would disproportionately impact people with low incomes.*

Transformational change: Irreversible, persistent adjustment in societal values, outlooks and behaviors of sufficient width and depth to alter any preceding situation. A structural change that alters the interplay of institutional, cultural, technological, economic and ecological dimensions of a given system. Example: *To achieve transformational change in society, we need connection and collaboration among people and organizations from all sectors and scales.*

Vulnerability: The propensity or predisposition of individuals, assets, or systems to be affected adversely by hazards. Vulnerability encompasses exposure, sensitivity, potential impacts, and adaptive capacity. Example: *Overfishing makes fish populations more vulnerable to warming ocean temperatures, which hinders recovery of overfished populations.*

Appendix F: Ready-to-Fund Resilience Advisory Group

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