Appendix C: Resilience Finance Roadmap Technical Appendix

Table of Contents

1 Climate Resilience Revenue Options, Financing Mechanisms, and Institutional Structures 1
1.1 Examples of Revenue Sources from Other Jurisdictions 1
1.2 Financing Mechanisms 4
1.3 Institutional Structures 8
2 Resilience Investment Opportunities and Impact Analysis 12
2.1 Summary of Revenue Options 12
2.2 Summary of Financing Mechanisms 14
2.3 Summary of Institutional Structures 15
2.4 Summary of Impact Analysis Ratings 16
2.5 Impact Analysis of Revenue Options 17
2.6 Impact Analysis of Financing Mechanisms 19
2.7 Impact Analysis of Institutional Structures 22

Tables

Table 1: **Summary of Revenue Options (Massachusetts is not currently considering new revenue options.)** 12
Table 2: **Summary of Financing Mechanisms** 14
Table 3: **Summary of Institutional Structures** 15
Table 4: **Summary of Impact Analysis Ratings** 16
Table 5: **Impact Analysis of Revenue Options (Massachusetts is not currently considering new revenue options.)** 17
Table 6: **Impact Analysis of Financing Options** 19
Table 7: **Impact Analysis of Institutional Options** 22

1 Climate Resilience Revenue Options, Financing Mechanisms, and Institutional Structures

Establishing sustained and diversified sources of revenue is essential for supporting long-term climate resilience investments. This section summarizes examples of revenue options, financing mechanisms, and institutional structures that have been implemented or considered in other states and sectors. These are not presented as recommendations for Massachusetts but are included as references for potential future exploration. Collectively, these tools offer insights into how other jurisdictions have approached the challenge of funding and financing climate adaptation efforts.

1.1 Examples of Revenue Sources from Other Jurisdictions

Experience from other states, local governments and sectors shows that establishing dedicated, recurring revenue streams can be catalytic to scaling climate resilience investments and unlocking additional financing opportunities. Over time, an effective revenue portfolio for resilience tends to be diverse, redundant, and sustainable. It can align with the scale and nature of identified climate risks. **While specific approaches must be tailored to local context, these examples provide a useful frame of reference should Massachusetts elect to evaluate additional options in future phases of investment system development. Massachusetts is not currently considering new revenue sources.**

Surcharge on Property Insurance. Many states attach fees or surcharges to raise revenues in support of consumer protection, public safety and emergency services, as well as support for state general funds. For example, the Massachusetts Department of Fire Services (DFS) is funded primarily through assessments on insurance companies issuing fire, homeowners' multiple peril, or commercial multiple peril policies on Massachusetts properties. This revenue stream is authorized by Massachusetts General Laws, Chapter 175, Section 195, which mandates that insurers contribute to cover DFS's estimated annual expenses. These assessments contribute significantly to the department's budget.

Some states, including New York, Connecticut, and New Jersey are investigating the potential for expanding the use of insurance surcharges as a mechanism for supporting local and regional climate adaptation and resilience projects and programs. Recent estimates suggest that the State of New York, for example, could generate anywhere from $1-3 billion homeowners' insurance surcharges over a ten-year period depending on the size of the surcharge (0.5%-1.5%).[1]

An advantage of this revenue approach is that it creates direct connections between the revenue source and the projects that the revenues support. Specifically, this direct connection exists if the revenues are used to address hazards that directly impact homeowners and businesses. One potential concern regarding this approach is that it will increase the cost of home ownership. Homeowners' insurance premiums have increased dramatically in recent years, with homeowners seeing a 12% increase in 2023 and an additional 6.9% increase in the first half of 2024.[2] An insurance surcharge could potentially exacerbate this problem.

Surcharge on Utility Bills. This approach is to include a resilience fee on every drinking water or wastewater utility bill. For example, a fee of just $5 per month per Massachusetts household would generate more than $140 million annually. Tax assessments on more than 180,000 businesses would add to the revenue total. In addition, because this represents an entirely new dedicated revenue source, it would not compete with other funding and supported programs within the general fund.

There is precedent for this approach. The Maryland Bay Restoration Fund (BRF) is a nationally significant water quality restoration funding program that was formed through State legislation signed into law on

[1] Keenan, J.M. Regional resilience trust funds: an exploratory analysis for leveraging insurance surcharges. *Environ Syst Decis* 38, 118–139 (2018).
[2] CNBC. Homeowners insurance has soared over 50% in these states.

May 26, 2004. The purpose of the Fund is to upgrade Maryland's wastewater treatment plants with enhanced nutrient removal technology. In addition, a similar fee paid by septic system users supports both upgrades to onsite wastewater systems as well as cover crop implementation on agricultural lands. It is important to note that the BRF is managed by state leaders in conjunction with the Clean Water State Revolving Fund (CWSRF) program, demonstrating the cross-component benefit and relationship of many of these opportunities. The BRF fees are $5 per month for residential dwellings; $60 per year for onsite sewage disposal systems or holding tanks that do not receive a water bill; and $5 per month per equivalent dwelling unit (EDU) for the first 2,000 EDU for multiple dwellings. The BRF generates approximately $130 million annually.

A fee attached to existing drinking water or wastewater bills would be indirectly associated with the ultimate use of the funds. This could create political challenges. One way to make the connection more direct is to convert the tax to a stormwater fee based on the level of impervious surface on a property. In effect this would result in the establishment of a state-level stormwater fee, which would be attached to water or wastewater bills. This approach is often used at the local level.[3] It is important to note that while many local stormwater enterprise funds are established to specifically address water quality and pollution control needs, these funds are increasingly being used to also address flooding and drainage concerns and hazards.[4]

Expanded State Sales Taxes. Sales taxes are calculated as a percentage of the sales price, collected from the purchaser at the time of sale, and remitted by the retailer to the state tax agency. Forty-five states and thousands of local governments use sales tax revenue to pay for a range of services.

How much revenue is generated by the sales tax depends on both the percentage tax rate and the "tax base" — the goods and services that are subject to taxation. Besides omitting most services from the tax base, many states exempt from taxation categories of goods viewed as necessities of life, such as food and medicine.[5] Some states levy special taxes on particular services in lieu of or in addition to the sales tax. For example, some states impose special taxes on car and hotel rentals, admission charges for entertainment and cultural events, and utility services like telephone and electricity. Where such taxes are not imposed in lieu of some other business tax (such as the corporate income tax), and where they legally may be passed on to purchasers like the sales tax through itemization on the bill or invoice, these special taxes may be thought of as sales taxes.[6]

There are two ways that jurisdictions have expanded sales taxes in support of particular uses. The first is to assess a small percentage increase in all sales taxes and then target these new revenues to a particular activity. A small, broad-scale increase would potentially result in significant revenue. In Minnesota for example, voters approved a ballot measure in 2008 to raise the sales tax by 3/8 of 1% to fund outdoor recreation and conservation. The tax has so far generated more than $2 billion in support of a variety of recreational and conservation activities.[7] The second option is to target a particular good or service for taxation. For example, many states fund environmental and natural resource conservation by taxing outdoor gear and recreational services. Texas, Virginia, and Georgia have passed bills that reallocate a portion of their outdoor gear tax towards funds for wildlife conservation. All three states' taxes encompass gear for non-hunting and fishing activities, such as hiking, camping, and water sports.[8]

Non-Ad Valorem Property Assessments. This approach is to include a non-ad valorem assessment on property tax bills. Non-ad valorem assessments are charges or fees, not a tax, to cover costs associated with providing specific services or benefits to a property.[9] The non ad valorem assessment is based on a unit of measure determined by governmental authority. Like the utility approach, the fee can be based on levels of impervious surfaces. As is the case with assessing a stormwater fee to water or wastewater bills, a non-ad valorem fee would not be connected to many of the key resilience measures, which would

[3] District of Columbia Department of Energy and Environment. Charges to the District's Stormwater Fee.
[4] City of Alexandria. Stormwater Fee; City of Austin. Stormwater Management Discount.
[5] Center on Budget and Policy Priorities. Expanding Sales Taxation of Services: Options and Issues.
[6] Ibid.
[7] Congressional Sportsman's Foundation. Conservation Sales Taxes.
[8] National Caucus of Environmental Legislators. State Wildlife Agency Funding.
[9] Berlin Patten Ebling. Ad Valorem & Non-Ad Valorem. What are they?

potentially restrict the use of funds. In addition, each of the proposed new revenue approaches could be considered regressive in nature in that every household pays the same fee regardless of income. However, there are ways to make a new fee more proportional. Specifically, states can exempt households that fall below the Federal Poverty Guidelines to eliminate the impact on lower income residents. Assuming this approach for illustrative purposes, with current demographic statistics as a guide, approximately 90% of the households in the Commonwealth would be subject to the fee (using an estimate of 2.33 million households). At $5 per month rate, this would generate approximately $140 million per year.

Community Wealth Funds. Many state and local governments own real property, the estimated value of which far exceeds the government's gross product. Most have not fully inventoried their assets, and fewer still have assigned them a current market value – often significantly higher than book values based on purchase price. When communities accurately assess public real estate values, their balance sheets often look very different. For example, the City of Boston's 2014 balance sheet showed liabilities of $4.6 billion and declared assets valued at $3.8 billion ($1.4 billion in real estate), resulting in a net worth of negative $800 million. With a current market value lens, municipal holdings were revalued at $55 billion – 40 times the initial estimated value. Policymakers may unlock these assets' value through Community Wealth Funds (CWFs).[10]

CWFs are progressive in nature, as they focus on managing public assets to benefit the entire community. By prioritizing investment in infrastructure, affordable housing, climate resilience, and social equity, CWFs aim to address issues that directly impact community well-being. The model promotes shared ownership, where the assets are managed for the community's long-term benefit rather than individual profit. However, ensuring that the revenue-generating activities do not exacerbate disparities (e.g., through gentrification) is essential.[11]

CWFs require robust administrative structures to manage assets, oversee development projects, and allocate revenue. Establishing a CWF entails creating governance models, inventorying public assets, and coordinating with multiple stakeholders, including public and private entities. Administrative challenges include aligning asset development with community priorities, managing public-private partnerships (PPPs), and maintaining transparency and accountability. The CWF concept can also be applied at the local level. The Boston case study described above demonstrates that local governments own significant real estate assets. The primary barrier to leveraging those assets is likely the need for technical capacity to implement CWF programs at the municipal level. There are potential linkages to local resilience institution building. For example, the Resilience Authority of Annapolis and Anne Arundel County is investigating the potential efficacy of establishing a CWF within that organization as a mechanism for generating revenues for climate resilience capital projects.[12]

Road and Transportation Tolls/Fees. The revenue generated from transportation-related fees can be used to pay for highway maintenance and operations, as well as to repay debt used to finance transportation infrastructure. Transportation fees can also be used to manage congestion and reduce environmental impacts. Fees can be based on different concepts, including:[13]

- ***Flat fees:*** A per-use fee that may vary by the number of axles or distance driven.
- ***Pricing****:* Fees that vary by the level of vehicle demand on the facility.
- ***Time-based charges:*** A user pays for a given period to use the infrastructure.
- ***Access fees:*** A user pays for access to a restricted zone for a period.
- ***Distance or area charging:*** A vehicle is charged per total distance driven in a defined area.

[10] NOEMA. How to Harness Cities' Hidden Public Wealth.
[11] Community Wealth Builders.
[12] Urban3. These Local Governments are Putting Their Assets to Work.
[13] Federal Highway Administration. Federal Tolling Programs.

Perhaps the most significant drawback to road fees is that they are generally regressive, meaning that low-income households pay a higher percentage of their income on fees than wealthier households. These fees can be less regressive than other transportation taxes, such as sales taxes. However, case studies suggest that tolls can be a more equitable way to fund transportation if the revenue is used to improve public transit. For example, San Diego's I-15 high-occupancy toll lanes dedicated some of their revenue to bus service in the area.[14] Road fees create a direct connection with key resilience measures that focus on transportation. In fact, that is the primary benefit of tolling: more consistent funding for highway construction and long-term maintenance. While this connection is important, transportation fees would not be an appropriate source for key resilience measure projects that are not directly connected to transportation infrastructure, or the impact of that infrastructure on the community.

Real Estate Transfer Taxes. A real estate transfer tax, sometimes called a deed transfer tax or documentary stamp tax, is a one-time tax or fee imposed by a state or local jurisdiction upon the transfer of real property. In other words, it's a fee charged by the government to legally transfer ownership when a home is sold.[15] Usually, this is an "ad valorem" tax, meaning the cost is based on the price of the property being sold.[16] Transfer taxes tend to be regressive in that they disproportionately impact lower income households. Increases in transfer taxes can result in decreases in housing affordability. This has an especially outsized impact on first-time homebuyers. Massachusetts has mitigated this by charging fees only for the portion of sales over $1 million, with the funds being used for housing trusts as a way for higher end housing to cross-subsidize affordable housing. Massachusetts assesses real estate transfer taxes at $2 per $500 of the sales price, though some communities have additional charges. However, any efforts to increase these fees have triggered concerns regarding impacts on housing affordability and have been met with significant political resistance, especially from the real estate and development industries.

Room Occupancy Tax. At its core, an occupancy tax is a levy charged on tourists who rent accommodations in a hotel, bed and breakfast or other lodging entities. Calculated as a percentage of the room rate, these taxes vary greatly from one jurisdiction to the next, adding a substantial level of complexity for businesses in the industry. The funds derived from occupancy taxes often promote tourism, improve local attractions, and support other similar initiatives which become instrumental in attracting more guests.

1.2 Financing Mechanisms

The capacity of debt financing to scale and accelerate project implementation while spreading costs over time is foundational to investment processes. However, additional financing mechanisms and processes can help advance other investment priorities, including mitigating project risk, incentivizing innovation and private sector engagement, and reducing long-term implementation costs. This section provides examples of financing mechanisms.

Expanded State Revolving Fund Programs. State Revolving Fund (SRF) programs are financing mechanisms that reduce the cost of project implementation by subsidizing the cost of borrowing money. A SRF is a pool of capital that is used to make loans to borrowers and then replenished with the interest and principal payments from those loans. This allows the fund to be used repeatedly to fund new projects. SRFs can be managed by a government agency or a third-party financial institution. The capital provider sets the terms and conditions for the loans, which are typically long-term and low interest. SRFs can be a critical source of financing when credit access is limited. They can also be a way to encourage private lending by demonstrating that lending to certain markets can be profitable.[17] SRFs have become the primary state-level financing mechanisms associated with drinking water and wastewater utilities and

[14] National Transportation Library. Income Based Equity Impacts of Congestion Pricing.
[15] Bankrate. How to sell your house in 2025: A step-by-step guide.
[16] Bankrate. What are real estate transfer taxes?
[17] Council of Development Finance Agencies. Revolving Loan Funds & Development Finance.

systems. Specifically, the CWSRF and the Drinking Water State Revolving Fund (DWSRF) have supported more than $125 billion in infrastructure improvements since their inception.[18]

In Massachusetts, loans from the CWSRF and DWSRF are administered by the Clean Water Trust and the Department of Environmental Protection manages the programs. Both programs have the potential to be important mechanisms for supporting climate resilience and adaptation. They currently can fund projects with resilience benefits, such as green and gray infrastructure upgrades, that improve water quality and reduce flood risk. However, program priorities are based upon water quality, and projects that primarily have resilience benefits rarely would be selected.

The SRF model can address climate resilience in two ways. First, the existing SRF model can be replicated to finance projects that are directly connected to climate adaptation.

Second, the programs can be expanded to include climate-related linked deposits. A linked deposit program (LDP) is a program that connects state SRF funds with loans made by financial institutions to businesses. The goal of these programs is to encourage lending to businesses that may be disadvantaged or have historically been denied access to other forms of capital, including the SRFs. LDPs can help businesses in several ways, including:

- ***Reduced-rate financing:*** LDPs can help businesses get financing at lower interest rates.
- ***Investment opportunities:*** LDPs can help businesses expand, upgrade equipment, develop new products, and more.
- ***Credit assistance:*** LDPs can help businesses, especially those that focus on climate resilience and adaptation project implementation, which may not have been credit worthy qualify for loans.

Pull Financing. Project risk mitigation is especially important for key resilience measures that are likely to include nature-based resilience projects such as living shorelines, forest restoration, and stormwater management. Pull financing is a term used to describe funding methods that reduce this risk by rewarding successful solutions to problems by meeting predetermined criteria. It is a way to incentivize the private sector to tackle a problem without choosing winners in advance. Pull financing can take many forms, including Pay-for-Performance (PfP) models, prize challenges, milestone payments, and advance market commitments. Pull financing can be a powerful tool for addressing difficult social problems.

- ***Pay-for-Performance.*** Public funding remains the backbone of large-scale ecosystem restoration across the country. Traditionally, these efforts rely on output-based procurement models in which funders prescribe specific actions or practices. While this approach provides clarity, it often favors familiar solutions over cost-effectiveness, limiting innovation and efficient use of public dollars.

  PfP financing offers a flexible alternative by tying payments to verified outcomes rather than prescribed actions. Implementers are incentivized to design and deliver the most effective strategies to achieve measurable results[19]—such as improved water quality, habitat restoration, or reduced shoreline erosion. This approach supports more efficient use of limited public funds and often accelerates implementation at scale.

  PfP systems also promote long-term stewardship by linking ongoing payments to sustained performance. This reduces risk for the public sector, ensures durability of outcomes, and creates clearer pathways for private capital to participate in resilience projects. By aligning payment with performance, PfP structures combine accountability with flexibility, making them a powerful tool in the resilience investment toolkit.[20] While not a replacement for all traditional funding mechanisms, PfP shares core features with other market-based tools—such as mitigation banking and PPPs—including an emphasis on efficiency, risk-sharing, and measurable impact. As Massachusetts

[18] National Resources Defense Council. Building Climate-Resilient Communities with State Revolving Funds.
[19] EnviroAccounting. Pay for Performance Toolkit.
[20] Winrock International. Pay for Performance Conservation: A How to Guide.

expands its investment system, PfP offers a promising option for increasing returns on public investment while delivering long-lasting resilience benefits.

- ***Reverse Auctions.*** Reverse auctions are in some respects an extension of PfP mechanisms in that the goal is to incentivize the most cost-effective approach for project implementation. A reverse auction is a bidding process where multiple sellers compete to sell goods or services to a single buyer at the lowest price. It is the opposite of a traditional auction, where the seller sets the price and buyers bid higher. In a reverse auction, the buyer posts a request for a product or service. Interested sellers anonymously bid on the opportunity to provide the goods or services. Finally, the buyer chooses the best offer and completes the transaction.[21]

  Reverse auctions can be used to allocate funds for climate resilience projects and programs. In these auctions, sellers compete to provide a specified good or service to buyers, such as acres of forest restoration, miles of fortified shoreline, reduced water volume and flooding potential. In short, this mechanism can be used to procure virtually any product or service, thereby ensuring that the most cost-effective outcomes are purchased.[22]

- ***Innovation Prize Funding.*** Innovation prize funding is a financial incentive that encourages change through competition. A report by Luminary Labs indicates that the influx of funding because of the Bipartisan Infrastructure Law and the Inflation Reduction Act have created unprecedented levels of federal funding. However, many federal agencies will use "push mechanisms" like grantmaking and policy to advance climate goals. However, grants alone are not enough to solve complex problems. When traditional funding mechanisms will not deliver an innovation fast enough — "pull mechanisms" and market-shaping tools like incentive prizes can accelerate innovation by delivering the right incentives at the right time to generate and develop the best ideas and solutions.[23]

  Prizes promote innovation by encouraging new ideas, proving the hardest test cases, building community, and democratizing innovation. Prizes define problems rather than solutions, allowing a diverse crowd of innovators to develop a wide variety of possible solutions. In effect, they allow investors to bet on a portfolio of ideas versus investing in only a few organizations with a narrow set of solutions. Prizes can be designed to address the most difficult aspects of a problem, such as the most critical use cases or the hardest-to-reach constituents. Frequently, the resulting solution has a much wider application.[24]

  Prizes offer unique financial benefits to identify and implement innovative approaches to climate mitigation and resilience. Specifically, prize programs require jurisdictional sponsors to only pay for successful outcomes. The largest expenditure for a prize occurs only after a solution that meets the criteria is achieved. In addition, prizes incentivize many teams to work on a solution, which in turn increases the amount of aggregate investment in research and development to solve a problem and reduces the risk that a successful solution will not be developed.[25]

Public-Private Partnerships. PPPs are another financing mechanism that can mitigate long-term implementation risk. PPPs are long-term contracts between a private party and a government entity for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance.[26] The private sector assumes responsibility for the infrastructure and is therefore likely to invest in more durable materials or efficient technologies to drive down lifecycle costs. While not the cheapest option in the short term, they have the potential to drive savings over the long term through decreased energy usage, lower maintenance costs, or enhanced resilience.[27]

---

[21] Investopedia. What Is a Reverse Auction? How It Works, Example, and Risks.
[22] World Resources Institute. Paying For Environmental Performance: Using Reverse Auctions to Allocate Funding for Conservation.
[23] Luminary Labs. Prizable climate opportunities.
[24] Investing in Results. The Power of Incentive Prize Competitions.
[25] Ibid.
[26] World Bank Group. About Public-Private Partnerships.
[27] Brookings Institution. Private Capital, Public Good: Drivers of Successful Infrastructure PPPs.

A PPP provides long-term agreements between the government and private sector entities that seek to provide public services or assets. The private sector entities invest capital in projects upfront and then generate revenue from taxpayers and/or users to make a profit. PPPs can be used by state leaders to raise capital, leverage expertise, and allocate risk. PPPs can also ensure that resources are well-distributed and are able to address the most pressing development needs.[28]

PPPs can potentially contribute to development and growth across all socio-economic sectors, benefiting private- and public-sector players. Creating effective PPPs entails enabling conditions at different stages of the key resilience measure planning, structuring, and implementation processes across four main elements of the investment ecosystem: governance, strategy, transaction process, and implementation/ monitoring.[29]

An interesting adaptation of the PPP model is called public-private-philanthropic partnerships (4Ps). This innovative model has been successfully applied to solving climate mitigation and natural resource restoration challenges. Climate and natural resource challenges entail deep, system-level transformation. This in turn requires an understanding of the needs and constraints of a broad and diverse set of actors, the ability to bring those actors together to address well-defined objectives, the willingness to take a long-term perspective that allows for action today with benefits in the future, the capacity to run a robust day-to-day operation with a team whose duties include ensuring the partnership stays on track with its initiatives, and an appetite for experimentation and risk-taking. By their very nature, 4P models are well suited to address these issues, because they bring together many actors, each with different capabilities and strengths.

More than 50 such 4P models within the climate and nature space have emerged in the last two decades, providing a sign of early progress in tackling some issues jointly. The Initiative 20x20 4P model has convened 150 partners and aims to change the dynamics of land degradation in Latin America and the Caribbean and advanced restoration across the region. The partnership has committed $2.5 billion of private capital to support government commitments to protect and restore more than 50 million hectares of land.

Value Capture Financing. Value capture financing has the potential to be one of the most important climate adaptation and resilience financing tools available to state and local governments. Value capture financing is a type of public financing that recovers some or all the value that public infrastructure generates for private landowners. This type of financing process is popular in many urban areas where the public sector is often responsible for the infrastructure required to support development. This infrastructure may include road infrastructure, parks, social, health and educational facilities, social housing, as well as climate adaptation and resilience measures.

The concept of value capture financing is that some landowners benefit more than others from government intervention, specifically as it relates to infrastructure development. This is especially important in the context of climate resilience given the unique nature of climate impacts. For example, landowners in coastal communities are directly impacted by sea level rise and therefore directly benefit from mitigation efforts to reduce associated impacts. Landowners further inland derive no direct benefit from these mitigation measures. Value capture accounts for this disparity.

Value capture schemes secure and recover a portion of the benefits delivered by public investments, to offset the costs of the investment itself. Value Capture strategies operate under the assumption that public investment often results in increased valuation of private land and real estate. By capturing the subsequent increase in value, governments can recuperate funds, which can ultimately be used to generate additional value for communities in the future. Value capture strategies are based on the idea that public investments increase the value of private property. Governments can then "capture" that increase in value and use it to generate more value for the community. Examples of value capture include:

[28] UNCTAD. What are PPPs?
[29] Arthur D. Little. Successful Public-Private Partnerships.

- ***Tax Increment Financing.*** Tax increment financing (TIF) is a method for funding development projects by capturing the increase in property tax revenue generated by those projects. TIF can be used to finance a variety of projects, including infrastructure, land acquisition, and climate adaptation projects. TIF can be a source of financing for resilience projects, but it can only be equitable if the increased property costs are not borne by low-income residents or property owners.

  When a TIF redevelopment project area (often called a TIF district) is created, the value of the property in the area is established as the "base" value of the project area. The property taxes paid on this base amount continue to go to the various taxing bodies as they always had, with the amount of this revenue declining only if the base declines (something that the TIF is expected to keep from happening) or if the tax rate goes down. It is the growth of the value of the subject property, because of the implementation of the key resilience measure for example, over the base value that generates the tax increment. This increment is collected into a special fund (a Special Tax Increment Allocation Fund, for example) for use by the government to make additional investments in the TIF or resilience project area. This reinvestment generates additional growth in property value, which in turn results in even more revenue growth for reinvestment.[30]

- ***Special District Governments.*** Special District Governments are an important tool for value capture and, like TIF, can reflect the uneven distribution of benefits associated with many climate adaptation and resilience investments. These are independent, special-purpose governmental entities—distinct from general-purpose governments like cities or counties—that possess substantial administrative and fiscal autonomy. They are typically created to deliver services that are not being provided by existing local governments, and in the context of climate resilience, they can finance and implement capital projects related to flood control, stormwater management, or other adaptation priorities.

  One financing tool commonly used by special district governments is the special assessment. Special assessments allow these districts to levy incremental property taxes or fees on land and buildings that derive direct benefit from specific infrastructure improvements. The tax typically represents a portion of the estimated benefit to properties located within a designated improvement zone. While not all special districts rely on special assessments, and not all special assessments are administered by special districts, the two are often used together. Special assessments are among the most widely used value capture mechanisms in the United States[31] and offer a way to equitably fund public improvements by aligning cost with benefit. When paired with the administrative capacity of a special district government, they can serve as an effective and targeted means of financing resilience infrastructure.

1.3 Institutional Structures

Institutional frameworks manage and execute finance initiatives. This section delves into various organizational models and governance approaches for establishing dedicated resilience entities, exploring how state, local, and regional authorities can be structured to optimize project management, revenue generation, and long-term financing for climate adaptation efforts.

Stormwater Drainage Utilities: A Stormwater Utility (SWU) is an enterprise program that collects fees for providing stormwater management services. Ratepayers are charged a fee based on the stormwater runoff impact their respective properties generate, using impervious surface as the measurement of that impact. A SWU provides a dedicated funding source for existing stormwater management services and new capital projects to reduce sediment and nutrient (nitrogen and phosphorous) pollution into local waterways. While SWUs are often used to address water quality requirements, they are also commonly used as mechanisms for addressing flooding and drainage needs and concerns.[32]

[30] City of Batavia. What Is TIF and How TIF Works.
[31] Federal Highway Administration. Special Assessments: An Introduction.
[32] Watershed Institute. Stormwater Utilities.

Twenty communities in Massachusetts have joined more than 1,800 communities across the country in successfully implementing SWUs, demonstrating their ability to generate significant revenue.[33] The fee structure can be adjusted periodically to reflect changing stormwater management costs or policy objectives, allowing for increased revenue as needs evolve. Again, this is especially important as climate resilience and flooding become more prevalent over time. Additionally, SWUs can introduce credit programs that incentivize property owners to implement green infrastructure solutions, such as permeable pavement or rain gardens, thereby promoting further environmental benefits.

SWUs provide a dedicated and scalable funding source for stormwater management through the collection of fees based on impervious surfaces on properties. By directly linking the fee to the stormwater runoff impact, SWUs create a consistent revenue stream that grows in proportion to urban development and the increase in impervious surfaces. The fee structure of SWUs is generally designed to be proportional to the property's stormwater impact, which is often measured based on the amount of impervious surface area. This makes the utility relatively fair, as larger properties that generate more runoff pay higher fees. However, there are equity considerations, as some low-income households or small businesses with large impervious areas may find the fees burdensome. These concerns can compound for renters of properties with high amounts of paved surfaces if/when property owners pass along the costs of a SWU fee to renters without the means to address the property's impervious surface areas. To address this, many SWUs incorporate equity measures, such as providing fee reductions or credits for low-income households and offering financial incentives for property owners who adopt stormwater management practices (e.g., installing green roofs or rain gardens). By including such measures, SWUs can maintain a more progressive approach to revenue generation while supporting broader community goals of environmental justice and inclusion.

Resilience Authorities. Resilience authorities are an emerging institutional model designed to expand public-sector capacity for climate adaptation and resilience investment. These quasi-governmental entities can be established at either the state or local level and are intended to help governments more effectively manage funding, accelerate project delivery, and streamline administrative processes associated with climate-related infrastructure.

When established at the local level, resilience authorities can enable municipalities or counties to avoid debt ceiling limitations, pursue flexible financing strategies, and act as grant-eligible community-based organizations. Maryland was the first state to authorize local resilience authorities through enabling legislation passed in 2020. At the state level, resilience authorities can serve broader coordination and financing functions across agencies and sectors, helping to align programs, centralize strategy, and advance investment in key resilience measures.

Regardless of scale, resilience authorities are designed to be adaptable. Their specific roles and responsibilities often reflect how they are capitalized, the institutional gaps they are intended to fill, and the governance structures in place. Common functions include facilitating interdepartmental coordination, engaging community stakeholders, housing technical and funding expertise, and serving as a central source of information for resilience planning and investment.

- ***Establishing a State-Level Resilience Investment Authority.*** The structure of a state-level resilience investment institution or authority will primarily depend on three key factors: the current state-level management of key resilience measures, the essential institutional functions required for key resilience measure project implementation, and the most effective governance structures.

  The current key resilience measures' investment and implementation processes are spread across various agencies. For instance, transportation-related key resilience measures have established investment systems, suggesting a new resilience institution might play an indirect financing role in such areas. Conversely, less structured key resilience measures will require a more direct investment role from a new institution. The combination of these existing capacities will directly influence the new institution's design.

[33] Western Kentucky University. Western Kentucky University Stormwater Utility Survey 2022.

An effective vestment system requires robust institutional capacity across three core components:

- Project Portfolio Management: This involves prioritizing, managing, coordinating, and implementing a comprehensive project portfolio across government departments and agencies. It also includes ensuring the engagement and participation of diverse stakeholders, especially underserved populations, to ensure investments meet their needs.
- Revenue Portfolio Management: A resilience organization will need to manage dedicated revenue streams for key resilience measure projects. This could involve directly assessing and collecting revenues (like utility commissions) or managing and investing resources without direct assessment authority (relying on sponsoring governments, as seen with Maryland's local resilience authorities).
- Financing Capital Projects: The institution will need to facilitate the financing of capital projects using various mechanisms, including traditional debt financing (e.g., revenue bonds), PPPs, performance-based procurement, and value capture programs (e.g., TIFs). The institution's role can be direct, like managing revolving loan funds (e.g., PennVest), or indirect, relying on other government entities for financing capacity.

There are three potential governance structures for a state-level authority. Each of these models expands institutional capacity:

- Distributed Institutional Model: This approach involves distributing resilience authority functions among existing state agencies. While it offers expediency by leveraging existing capacities, it may lack the cohesive leadership and focused approach of a dedicated entity, essentially expanding the status quo. To be effective, it would require a designated lead agency to centralize control over the climate implementation and investment process.
- New, Independent Resilience Authority: Creating a new, independent organization offers several advantages. Such an authority would be responsible for managing, prioritizing, and guiding capital projects across key resilience measures, particularly those not directly linked to existing agency funding. This model provides long-term stability due to a degree of separation from political shifts (assuming dedicated revenue streams) and fosters specialized expertise and technical capacity. Establishing it would likely require legislative approval and consistent, dedicated funding.
- Embedded Institutional Model: This approach combines elements of the distributed and independent models by placing the leadership and financing functions of the state's climate action and resilience investment system within an existing governmental institution. While key resilience measure project functions might still be distributed, the core financing and investment processes would be centralized. This model can provide similar benefits to a new institution, such as enhanced portfolio management and inter-departmental coordination. A key advantage is a potentially faster implementation timeline, as it does not require new enabling legislation. However, it necessitates careful integration into the host agency's culture and thorough analysis of its existing structures.

- **Establishing Local and Regional Resilience Authorities.** Beyond state-level initiatives, local governments can tailor these authorities to their specific needs, determining their organizational structure, governance, staffing, budgeting, and financial procedures. An authority might be chartered by a single government or as a partnership of multiple jurisdictions (e.g., the Resilience Authority of Annapolis and Anne Arundel County). Their project portfolio is not limited to the geographic boundaries of the incorporating local government.

  This concept has been applied at the county scale in Maryland, a jurisdiction with strong county-level government. In Maryland, for example, authorities cannot directly assess taxes or fees but

can receive funds from virtually any other source. This has enabled organizations like the Annapolis and Anne Arundel County Authority to raise significant funds from outside local government.

Local and regional resilience authorities will be most effective when they have the capacity and structure to fully manage and administer the resilience investment system. Their benefits include:

- Enhanced Cross-Municipal Collaboration: They are designed to facilitate interdepartmental cooperation for coordinated, intragovernmental climate action, especially crucial for complex infrastructure projects.
- Engaging Diverse Community Stakeholders: Their flexible governance structures enable effective leadership in both community engagement and project implementation, particularly vital when prioritizing projects with limited funding.
- Centralized Climate Resilience Information: Authorities can serve as a knowledge base for climate action and resilience efforts, centralizing often-siloed information and ensuring efforts are driven by current science and community input.

2 Resilience Investment Opportunities and Impact Analysis

This appendix provides a summary analysis of various investment opportunities, financing mechanisms, and institutional structures that could inform efforts to enhance climate resilience in Massachusetts. It includes illustrative examples of five revenue-generating options, six financing mechanisms, and three institutional approaches—outlining their structures, potential scales, impacted stakeholders, and the role of state government. These examples are not recommendations but are included to show how such approaches have been structured and evaluated elsewhere, and how they might be considered in a Massachusetts context during future phases of implementation. Massachusetts is not considering new revenue options.

The section also presents a high-level impact analysis of these options using key criteria such as equity implications, stability, political feasibility, complexity, and speed of implementation. This includes both a summary of comparative ratings and more detailed discussions for each category. The findings underscore the importance of balancing expediency with long-term sustainability and scale, noting that a diverse portfolio of revenue sources may be necessary to meet the Commonwealth's climate resilience and adaptation goals. In addition, the analysis suggests that carefully designed financing structures can improve equity and environmental justice outcomes, helping to address the potentially regressive impacts of certain revenue models.

2.1 Summary of Revenue Options

Table 1, "Summary of Revenue Options," outlines five potential options for generating revenues: Surcharge on Property Insurance, Flat Fee Surcharge on Wastewater Utility Bills, Expanded State Sales Tax, Non-Ad Valorem Property Tax Assessment, and Community Wealth Funds. For each option, the table details its structure, estimated annual revenue, who would be impacted, and the role of the state government in its implementation. Revenue estimates range from $120 million per year for a property insurance surcharge to $205 million per year for a flat fee surcharge on wastewater utility bills.

Table 1: **Summary of Revenue Options (Massachusetts is not currently considering new revenue options.)**

Name	Revenue Estimate (Dollars per year)	Structure	Impacted Stakeholders	Role of State Government
Surcharge on Property Insurance	$120 million per year (assumes 3% surcharge)	• The Commonwealth imposes fees on insurance companies • Fee passed on the policyholders in the form of surcharges	• Property owners • Insurance companies	• Pass legislation • Distribute revenue for resilience projects
Flat Fee Surcharge on Wastewater Utility Bills	$205 million per year (assumes $6/month fee)	• Local utility charges and collects fee • Revenues transferred to state or regional agency/authority • Revenue allocated for resilience projects by state or regional agency/authority	• All utility customers • Local water/ wastewater utilities • Private resource owners	• Pass legislation • Distribute revenue for resilience projects

Name	Revenue Estimate (Dollars per year)	Structure	Impacted Stakeholders	Role of State Government
Expanded State Sales Tax	Increasing the general sales tax by 0.1% would generate approximately $151 million in additional revenue. A 0.13% increase would generate approximately $188 million	• Department of Revenue (DOR) administers expanded sales taxes at point of sale, targeting a specific good/service (i.e., sporting goods or hotel occupancy tax) • Taxes collected and remitted to the state • State agency allocates revenue to resilience projects	• Consumers • Relevant Businesses	• DOR collects and remits to applicable agency
Non-Ad Valorem Property Tax Assessment	$195 million per year (assumes $6/month fee)	• The Commonwealth or its municipalities impose a fee on property owners to cover the costs required for specific services that benefit a property • Fees are transferred to a resilience authority or other agency • State allocates revenue to resilience projects that benefit the property	• Property Owners • Local governments	• Pass Legislation • Collect and distribute revenue • DOR provides guidance and oversight to local assessors
Community Wealth Funds (CWFs)	Depends on the value and potential of the asset	• State or local assets are assessed for potential revenue generation • Professional management team maximizes revenue generation of the asset • Additional revenue is placed in a CWF and used for climate action or resilience infrastructure investment	• State and local governments • Communities	• State government would regulate or set forth the parameters • Local governments to oversee within those parameters

2.2 Summary of Financing Mechanisms

Table 2, "Summary of Financing Mechanisms," presents six mechanisms for financing resilience projects. These include Expanded State Revolving Loan Fund Programs, Pay-for-Performance Procurement Systems, Reverse Auctions, Innovation Prize Funding, Public-Private Partnerships, and Value Capture Financing. The table summarizes the structure of each financing mechanism and the role of the state government in its application.

Table 2: **Summary of Financing Mechanisms**

Name	Structure	Role of State Government
Expanded State Revolving Fund (SRF) Programs	• Finance projects directly connected to climate adaptation, and expand programs to include climate related linked deposits	• Administers and manages the SRF • Capital provider sets the terms and conditions for the loans
Pay-for-Performance Procurement Systems	• Governmental entities procure projects through competitive processes • Contractor/vendor determines specific conservation options to implement to reach required level of performance/benefits	• Define outcomes, develop performance metrics, establish payment structure, monitor and verify outcomes, and make payments
Reverse Auctions	• State or local government is the buyer who puts out requests for product or service • Interested seller bids anonymously on the opportunity	• Commonwealth sets the parameters for the auction process
Innovation Prize Funding	• Commonwealth only pays for successful outcomes	• Define goals and objectives, set prize structure, develop rules, marketing, managing application process, selecting winners, and providing post-competition support
Public-Private Partnerships	• Private sector partner provides upfront capital to finance project • Private sector is responsible for the construction, operation, and ongoing maintenance and management of project	• Project identification and initiation • Project structuring and procurement • Contract negotiation with private sector • Project monitoring • Post project management
Value Capture Financing (VCF)	• Public investments increase the value of private property • Governments "capture" the increase in value and use it to generate more value for the community	• Pass legislation and regulation of VCF tools • Identify infrastructure projects • Develop financing structure

2.3 Summary of Institutional Structures

Table 3, "Summary of Institutional Structures," summarizes three approaches for expanding organizational and institutional capacity for resilience: Local Stormwater/ Drainage Utilities, State-Led Resilience Authorities, and Local Resilience Authorities. For each institutional option, the table describes its structure and the specific role of the state government in its development and implementation.

Table 3: **Summary of Institutional Structures**

Name	Structure	Role of State Government
Local Stormwater/ Drainage Utilities	• Utility created by local ordinance or charter where ratepayers are charged a fee based on the stormwater runoff impact their property has • Using impervious surface to measure the impact	• Determine appropriate revenue mechanism • Establish fee structure • Develop governance structure • Facilitate public involvement • Ensure long-term sustainability
State-Led Resilience Authority	• Quasi-governmental organization • Organizational structure, governance, staffing, budgeting, and financial procedures are determined locally • Chartered by a single government or as a partnership of multiple jurisdictions	• Development and implementation.
Local Resilience Authorities	• Quasi-governmental organization • Organizational structure, governance, staffing, budgeting, and financial procedures are determined locally • Chartered by a single government or as a partnership of multiple jurisdictions	• Local jurisdictions would be responsible for local resilience authority development and implementation.

2.4 Summary of Impact Analysis Ratings

Table 4, "Summary of Impact Analysis Ratings," provides rating for revenue options, financing mechanisms, and institutional structures based on several criteria: Equity Impacts, Stability, Political Feasibility, Complexity, and Speed of Implementation. The legend indicates the range from "Positive (P)" (most positive, fastest, least negative) to "Negative (N)" (most detrimental, slowest, least positive), with "Moderately Positive (MP)," "Neutral or Intermediate (NI)," and "Moderately Negative (MN)" ratings in between. For instance, "Surcharge on Property Insurance" and "Community Wealth Funds" are rated as "Moderate Negative (MN)" for Stability, while "Expanded State Revolving Loan Fund Programs" and "Local Stormwater/ Drainage Utilities" are noted as "N/A" for Stability.

Table 4: **Summary of Impact Analysis Ratings**

Options	Equity Impacts	Stability	Political Feasibility	Complexity	Speed of Implementation
Revenue Options (Massachusetts is not currently considering new revenue options.)					
Surcharge on Property Insurance	N	MN	NI	NI	MN
Flat Fee Surcharge on Wastewater Utility Bills	MN	P	NI	MN	MN
Expanded State Sales Tax	MN	P	MN	MP	MP
Non-Ad Valorem Property Tax Assessment	N	P	MN	NI	NI
Community Wealth Funds	P	MN	P	P	MP
Financing Mechanisms					
Expanded State Revolving Loan Fund Programs	P	N/A	MP	MP	MN
Pay-for-Performance Procurement Systems	MN	N/A	P	MP	MP
Reverse Auctions	MN	N/A	P	MP	MP
Innovative Prize Funding	MP	N/A	MN	P	NI
Public-Private Partnerships	MP	N/A	MN	MN	N
Value Capture Financing	P	N/A	MN	P	MN
Institutional Structures					
Local Stormwater/Drainage Utilities	MP	N/A	MN	NI	MP
State-Led Resilience Authorities	P	N/A	MP	MP	MN
Local Resilience Authorities	P	N/A	MP	MP	MN

Legend

Positive	P	Most positive, fastest, least negative
Moderately Positive	MP	Somewhat positive, fast
Neutral or Intermediate	NI	No impact, neutral benefit/detriment, average speed
Moderately Negative	MN	Somewhat detrimental, slow
Negative	N	Most detrimental, slowest, least positive

2.5 Impact Analysis of Revenue Options

Table 5, "Impact Analysis of Revenue Options," offers a detailed analysis of five revenue options against criteria such as Equity Implications, Complexity, Speed of Implementation, and Unintended Consequences/Co-Benefits. The revenue options analyzed are Surcharge on Property Insurance, Flat Fee Surcharge on Wastewater Utility Bills, Expanded State Sales Tax, Non-Ad Valorem Property Tax Assessment, and Community Wealth Funds. For example, the Flat Fee Surcharge on Wastewater Utility Bills and Expanded State Sales Tax are noted as "Inherently regressive" and "Regressive" respectively in terms of Equity Implications.

The benefits of all revenue options are based strictly on their capacity to generate statewide revenues. Revenues would be unrestricted, therefore appropriate for project implementation across all key resilience measures.

Table 5: **Impact Analysis of Revenue Options (Massachusetts is not currently considering new revenue options.)**

Name	Equity Implications	Complexity	Speed of Implementation	Unintended Consequences/ Co-Benefit
Surcharge on Property Insurance	• Greater impact on homes and businesses in high-risk areas where property insurance premiums are higher	• Requires legislation • Administrative infrastructure in place • Political barriers likely exist	• Existing system would enable administrative implementation	• Could reduce home ownership affordability
Flat Fee Surcharge on Wastewater Utility Bills	• Inherently regressive. Impacts limited with a modest surcharge • Could negatively impact some small or underfunded businesses	• Will require authorizing legislation, policies, and regulations • State administration and coordination with publicly owned treatment works required • Must establish administration systems for collection of fees from properties with septic systems • Indirect connection to key resilience measures may be a barrier	• Significant administrative processes necessary	• May create ratepayer confusion regarding intended use of the surcharge
Expanded State Sales Tax	• Regressive. Mitigate by exempting essential goods or allowing for sales tax deductions from income taxes	• Requires legislation • Administration systems in place with low administrative burden • Political barriers likely exist	• Established administrative infrastructure • Legislative approval would drive implementation timing	• Could negatively impact small businesses that are competing with large retailers on cost

Name	Equity Implications	Complexity	Speed of Implementation	Unintended Consequences/ Co-Benefit
Non-Ad Valorem Property Tax Assessment	• Regressive • Increases the cost of home ownership • Impacted dependent on the level of surcharge	• State must work through municipal governments to levy and collect the surcharge • Political barriers likely exist	• Administrative infrastructure is in place at the local level • Requires coordination and modification of existing systems	• Could reduce home ownership affordability
Community Wealth Funds	• No direct impact	• Legal, administrative, and regulatory barriers are low • Legislation needed to transfer funds to resilience projects rather than the general fund • Existing property management system • Political barriers are likely low	• The State's existing capacity supporting timely implementation • Legislative approval to transfer funds will likely dictate timing	• Diversion of funds from the general fund Co-Benefits: • Economic and infrastructure development at the local level

2.6 Impact Analysis of Financing Mechanisms

Table 6, "Impact Analysis of Financing Options," provides an in-depth analysis of six financing mechanisms across several criteria: Equity Implications, Complexity, Speed of Implementation, Unintended Consequences, Co-Benefits, and Relevant Key Resilience Measure. The financing mechanisms examined include Expanded State Revolving Loan Fund Programs, Pay-for-Performance Procurement Systems, Reverse Auctions, Innovative Prize Funding, Public-Private Partnerships, and Value Capture Financing. For instance, Expanded State Revolving Loan Programs can "lower borrowing costs and provide loan forgiveness for disenfranchised communities," while Public-Private Partnerships may lead to "higher costs for the government."

Table 6: **Impact Analysis of Financing Options**

Name	Equity Implications	Complexity	Speed of Implementation	Unintended Consequences	Co-Benefit	Relevant Key Resilience Measure
Expanded State Revolving Fund (SRF) Programs	• Can lower borrowing costs and provide loan forgiveness for disenfranchised communities • Can require small/local business participation	• Existing SRFs can be used to advance certain resilience projects with some policy changes • Creating a new SRF for climate resilience requires enabling legislation	• No legislation required for expanding existing programs • Establishing a new resilience-focused loan program requires significant administrative, policy, and legislative processes	• Could crowd out private investment	• Provide a mechanism for underserved communities to enhance long-term credit ratings and financial capacity • Can incent small, local, and minority business participation	• Appropriate for virtually all capital projects assuming certain conditions are met, including financial feasibility
Pay-for-Performance Procurement Systems	• Balance project with efficiency and cost benefit • Equity and fairness must be required outcomes or costs will dictate implementation	• No legislative approval required • Require policy changes within existing procurement systems • Low administrative changes/ requirements • Benefit greatly if public revenues are non-reverting	• Can be used to support many existing funding systems • Implementing and monitoring can be complex and time-consuming, requires staffing and expertise to be effective	• Narrow focus on measurable outcomes as opposed to hard to quantify outcomes such as innovation • Poorly designed metrics can disadvantage some contractors, such as small businesses or those working in disadvantaged areas	• Improved capacity to identify, quantify, and measure resilience outcomes	• Environmental restoration and conservation projects • Nature-based solutions • Flood mitigation and floodplain reconnection, shoreline protection • Urban green infrastructure and stormwater management

Name	Equity Implications	Complexity	Speed of Implementation	Unintended Consequences	Co-Benefit	Relevant Key Resilience Measure
Reverse Auctions	• Must balance project outcomes with efficiency and cost benefit • Equity and fairness must be included as required project outcomes. Without this requirement, costs will dictate implementation efficiencies	• No legislative approval required • Require policy changes within existing procurement systems • Relatively low administrative changes/ requirements	• Can be used to support many existing programs • Requires proper systems (outreach, notice, tailored requirements) to ensure that the bidding process is implemented equitably and effectively	• Focus on price reduction can lead to reductions in on quality or service levels • Suppliers' hesitation to invest in research and development or innovative solutions if they fear being undercut on price • Fast-paced nature can increase the risk of mistakes and misunderstandings	• Cost reductions • Attraction of new suppliers and contractors • Increased competition leading to innovation and better service offerings	• Services and projects that are widely available from multiple suppliers with similar specifications. This would include key resilience measures such as culvert and small bridge steam crossings, as well as many nature-based projects associated with flood mitigation and shoreline protection.
Innovative Prize Funding	• Generally benign in impact • Can be used to identify unique policy approaches associated with climate and environmental justice	• No legislative authority needed • Requires few additional administrative structures • Can occur across multiple agencies	• Requires upfront resources and time to result in appropriate innovations and policy interventions	• May incentivize rapid solutions which are not sustainable or adaptable to the long-term challenges • Large organizations with significant resources may have an advantage and limit opportunities for smaller, innovative teams • Competitors may rely on established methods and technologies rather than exploring novel, potentially disruptive ideas	• May address complex policy and normative issues, including the relationship between cultural and economic resilience to infrastructure development and implementation resulting in identification of a broad array of climate interventions	• Applicable to all key resilience measures. • The effectiveness of this mechanism is based on the need for clearly articulated problem statements and desired outcomes. This includes clear metrics to evaluate the success of proposed solutions.

Name	Equity Implications	Complexity	Speed of Implementation	Unintended Consequences	Co-Benefit	Relevant Key Resilience Measure
Public-Private Partnerships (PPPs)	• Benign in potential impact • Can advance policy approaches associated with climate and environmental justice, and require small/local business participation	• Currently authorized by statute • State oversight systems are in place	• Complexity can result in protracted contract negotiations due to the need to balance risk, develop financing structures, and ensure appropriate regulatory frameworks	• Private partners often demand higher returns for the risks they assume, leading to higher costs for the government • Significant transaction costs and legal fees • Reduction in transparency and public oversight • Overreliance on PPPs can weaken the public sector's capacity to deliver essential services	• Economic and job growth by creating jobs during construction and operation • Private sector investment, boosting local economies • Reduces public sector need to hire specialized and highly paid staff	• Large scale capital projects for transportation systems, water/wastewater systems, and stormwater management. These mechanisms are often used to support projects with built in revenue streams such as road tolls and service fees.
Value Capture Financing	• Based on special assessment districts which subsidize implementation in poorer communities, effectively providing assessments • Benefits in wealthy communities are funded directly by those communities	• Various forms of value capture are active within Massachusetts • Requires few changes to existing administrative infrastructure	• These complex financing mechanisms require the development of complex legal structures	• Subsidies can crowd out market-driven development • Can divert property tax revenue from other taxing authorities • Can be complex and opaque, leading to diminished public understanding	• Can help reduce public debt and fiscal burdens • Can help revitalize blighted areas • Can increase property values leading to higher tax revenues for the local government • Improvements can attract businesses and developers, leading to new investment and job creation	• Projects related to shoreline protection, erosion, flooding, dam restoration and repair, and urban green infrastructure. • Both tax increment financing and special district financing function most appropriate when the benefits accrued can be accurately and consistently measured and quantified.

2.7 Impact Analysis of Institutional Structures

Table 7, "Impact Analysis of Institutional Structures," analyzes three institutional structures: Local Stormwater/ Drainage Utility, State-Led Resilience Authority, and Local Resilience Authorities. The analysis covers Equity Implications, Complexity, Speed of Implementation, Unintended Consequences/Co-Benefits, and Relevant Key Resilience Measure. For example, a State-Wide Resilience Authority "Will enable effective leadership and guidance regarding the equity and fairness of the investment process," while a Local Stormwater/ Drainage Utility's development "can take a few months to a few years."

Table 7: **Impact Analysis of Institutional Options**

Name	Equity Implications	Complexity	Speed of Implementation	Unintended Consequences/ Co-Benefit	Relevant Key Resilience Measure
Local Stormwater/ Drainage Utility	• Can ensure that investment decisions balance resilience needs and benefits with equity and fairness	• Established in communities across the Commonwealth • The process for developing and launching has become more efficient • Assessing new fees will likely confront political barriers	• Utility development can take a few months to a few years • The process may be expedited through existing legislation • The most time intensive processes are rate modeling and local legislative approval	• Decreased attention given to core programs, specifically those related to water quality and green infrastructure Co-Benefits: • Synergies between water quality restoration and climate resilience	• By design, focused on water quality, green infrastructure, and storm drainage. • Appropriate for key resilience measures that incorporate nature-based solutions to climate impacts. • Can be adapted to meet other infrastructure needs, such as dam restoration and protection.
State-Led Resilience Authority	• Will enable effective leadership and guidance regarding the equity and fairness of the investment process	• Require legislative approval • Requires the development of significant administrative structures through rules, policies, and procedures	• Establishing a new state-wide authority will require significant investments of time and expertise • Distributed approach can be accomplished relatively quickly • Embedded approach may require enabling legislation, the primary administrative infrastructure is in place	• Could become isolated from other parts of government, thereby increasing bureaucratic inefficiencies Co-Benefits: • Could facilitate local economic development and improve local financing institution capacity • Embedded authorities can braid funding streams and programs to maximize impact	• Relevant for all types of resilience projects and measures

Name	Equity Implications	Complexity	Speed of Implementation	Unintended Consequences/ Co-Benefit	Relevant Key Resilience Measure
Local Resilience Authorities	• Can improve the capacity of environmental justice communities, enabling more effective and scaled project implementation	• Require legislative approval at the state and local levels • New or embedded agencies will require significant local administrative infrastructure • Creation of decentralized/local authorities will require local ordinance adoption	• Establishing a new local authority will require significant investments of time and expertise • Distributed approach can be accomplished relatively quickly • Embedded approach may require enabling legislation	• Time needed to launch new institutions can delay project implementation • Could lead to increased bureaucratic inefficiencies Co-Benefits: • Could facilitate local development and improve local financing institution capacity	• Relevant for all types of resilience projects and measures