A Report of the

Financing and Funding Adaptation and Resilience Working Group

Prepared for the Governor's Council on Climate Change

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Financing Adaptation and Resilience Working Group

(in alphabetical order)

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Executive Summary

This report reflects the deliberations of the Financing Resilience and Adaptation Working Group of the Governor's Council on Climate Change to carry out the charge under Executive Order 3[1] of making "recommendations and proposals for funding sources and financing mechanisms to advance investment in recommended strategies." The Working Group integrated direct participation and report review comments from the Equity and Environmental Justice Working Group to address how recommendations can be inclusive of the views and needs of underserved and resource-limited environmental justice communities, including low-income and other communities of color who are disproportionately impacted by the effects of climate change. Because of these ongoing inequities, we viewed our charge through an equity lens to prioritize and improve social equity outcomes whenever public resources are funding and financing resilience and climate adaptation in Connecticut with philanthropic foundations, non-profit or for-profit corporations, or municipal, state, tribal, and federal governments.

This report summarizes immediate actions the State could take to advance investment in climate resilience and adaptation. It draws and builds upon the findings of several similar reports reviewing financing and funding options for resilience from within Connecticut and around the country.[2,3,4] We used a high-level systems approach identifying a large spectrum of financing mechanisms that are available and emerging to protect people from climate risks. The diversity of options reflects the diversity of the Working Group's members and areas of expertise. This report is meant to serve as a guide to state leaders now and in the future.

Framing. The report frames the needs for climate resilience financing and funding through a discussion of unmet disaster recovery needs following numerous past storms with national disaster declarations in Connecticut, noting the insured assets are at greater risk from climate change, and reviewing the impact of climate change on the financial markets, including the current regulatory practice of not informing investors of physical and transitional climate risks, warnings of a potential mortgage default crisis, and the potential downgrading of state and municipal bond ratings due to increasing costs if adequate, dedicated and recurring funding sources are not budgeted and invested in proactive natural hazard mitigation and climate resilience projects from planning through operation. The recent public health and economic impacts of COVID-19 and Isaias are also discussed.

Findings. The working group reviews focus topics of its deliberations, including barriers to financing, an insurance perspective on climate risks, the integration of equity and public health benefits with nature-based solutions, engaging foundations and philanthropic organizations to partner with the public and private sector on capacity building investments in communities, and assessing the equity impacts of financing and funding mechanisms as positive, neutral or negative to distressed communities.

Barriers. Identified barriers were largely drawn from previous reports as well as the experience of Working Group members and included disproportionate impacts on vulnerable communities, disaster recovery funding programs increasing the racial wealth gap of whites and people of color, inadequate information on costs and benefits, incorrect pricing of risk, collective action challenges, capital budget constraints, limited ability to borrow funds, misaligned incentives, and difficulty obtaining grant funding.

Insurance. Several areas are highlighted that could be further explored as a focus area for insurance, including adjusting the rate to risk, investing in pre-disaster mitigation, aligning land use policies with insurance risk, improving building standards and ensuring adherence to those standards, improving the take-up of flood insurance, educating consumers, and correcting a lack of incentives for following codes and improving buildings.

Nature-based Solutions (NBS). All strategies for implementing and financing of adaptation programs and projects should be mindful of the limitations of hardening and armoring (sea walls, rip rap, river channeling, and other hard protection structures) and the benefits of nature-based solutions and "green infrastructure" or "living shoreline" strategies. Armoring is essential and effective in some situations, but can actually exacerbate flooding in many locations. They can also significantly degrade or destroy tidal wetlands and flats, river floodplains, and other natural habitats that can protect human infrastructure by absorbing and reducing storm and flood surge. Restoration of tidal marshes and beach dunes, urban street-side rain gardens, removal of high hazard dams, replacement of undersized road culverts, and other NBS can all provide effective protection of neighborhoods, roads, and critical community infrastructure while also providing enhanced amenities for people and habitat for wildlife. Furthermore, a predictable steady investment in NBS will have multiple societal benefits: Flood control, urban workforce development, increasing wildlife. Planners, agencies, and non-profits have compiled a database of nearly 500 Nature-Based Resilience projects in Connecticut that could provide these benefits, but are in need of funding. Federal resilience funding sources from FEMA and NOAA also prioritize projects that integrate NBS.

Foundations and Philanthropy. Communities face many potential funding challenges when it comes to resilience and adaptation – among them the inability to meet qualifications for different funding sources, limited research capacity to search for the suite of funding sources available to them, changing technology, competition with other organizations, narrowness in grant scoping, changing funding priorities, funding limitations and restrictions, and/or funding shortfalls. Foundations and the philanthropic community provide a complementary funding pathway for financing climate adaptation and resilience programs and projects that can work alone or in partnership with state and federal funding sources, but that may be particularly well suited to addressing these challenges at the community scale. In Connecticut that capacity includes engaging communities of color in decision-making; taking the long view on partnerships; advancing policy, knowledge and practice; funding planning and demonstration grants; providing required non-federal or non-state matching funds; and impact investing.

Equity Lens. Equity starts by recognizing that there are disparities and inequities in living conditions. Some communities lack resources, political power, and access to higher education, or have poor health outcomes that place low-income communities and communities of color at

greater risk while limiting their capacity to adapt to climate change. Climate change poses the greatest threat to vulnerable communities that are least responsible for it, or conversely, those who have contributed the most to climate change are better positioned to protect themselves from its impacts. The Financing Adaptation and Resiliency, and Equity and Environmental Justice Working Groups of the Governor's Council on Climate Change, are committed to continuously assessing whether existing, new, emerging, or expanded climate funding and financing mechanisms are sufficient and available to improve the needs of vulnerable communities. These mechanisms are significant, but are they enough and attainable for those who need them the most? To that end, these Working Groups, guided by the Environmental Justice Public Participation Guidance, and Guidance on Remote Engagement for Public Participation developed a process to address these issues that is ongoing.

Recommendations for Financing and Funding Options. The recommended options for financing and funding resilience adaptation are summarized below and reflect ideas from several previous reviews of the same topic and the perspectives and experience of the members of the Working Group. The recommendations are organized under five strategies with recommended implementation actions under each strategy. The complete recommendations in the full report include a brief description of the recommendation, a list of implementation entities, an equity lens with a review of equity issues and protection of vulnerable communities, and the scale of funding associated with the action.

Strategy 1: Build the governance structure to allow for effective and efficient financing and funding.

Recommended Implementation Actions:

- Increase Connecticut's capacity and competitiveness for securing federal funds for resilience.
- Incentivize private developers and businesses to implement resilience standards and disaster preparedness.
- Require the disclosure of physical and transitional climate risks at the state and municipal level.
- State funded and initiated infrastructure and building projects should lead by example to establish and meet climate adaptation and resilience standards.
- Create a central governance authority for the funding, financing and operations of resilience infrastructure projects.
- Build outreach and capacity and tracking for the increased uptake of flood insurance. Double the number of properties covered by flood insurance by 2022.

Strategy 2: Generate revenue sources to pay for resilience projects and programs

Recommended Implementation Actions:

- Establish 'resilience fees' to provide revenue sources for resilience and adaptation funds and matching funds for grants. Resilience fee options include:
    - Transaction Fee - Municipal Conveyance Fee.
    - User Fee - Wastewater use fee.
    - Licensing and Permitting Fees – Built environment.
    - Retail fees – Built environment.
    - Carbon fee.
- Increase funding for Community Investment Act (CIA).
- Create guidance to use Tax Increment Financing (TIF) Districts for resilience.
- Approve legislation for municipalities statewide to form stormwater utilities to fund resilient infrastructure.
- Approve legislation for Property Assessed Resiliency for climate adaptation improvements at commercial buildings with C-PACE.
- Promote the bundling of climate resilience and adaptation measures into Energy Savings Performance Contracts (ESPCs).

Strategy 3: Supply grants, matching funds for federal grants and loans to fund resilience projects and programs

Recommended Implementation Actions:

- Create an Environmental Infrastructure Bank.
- Provide State general obligation bond funding as green bonds for financing resilience and adaptation programs and projects and providing matching funds for federal grants.
- Implement the 10% of the State Revolving Loan Funds that can be used to finance green infrastructure projects and expand eligibility to flood control and microgrid projects.
- Incentivize Connecticut's insurance industry to promote and grow Catastrophe Bond market in Connecticut and set up a pilot program for Resilience Bonds to finance resilient infrastructure.
- Revolving loan fund for 1-6 family affordable housing purchase and rehabilitation.
- Financing for resilient housing upgrades including construction of ADUs and home elevation.

Strategy 4: Investigate the use of tax credit programs to incentivize the private sector to invest in community resilience.

- Investigate the use of the New Market Tax Credit,
- Investigate Opportunity Zones for clean energy projects and job creation. The Norfolk Solar II QOZ Fund in Virginia is now available to commercial investors. The investment partners have identified $150 million worth of potential sites

needing 90 MW of solar. These private investment partners expect to create over 200 clean energy Opportunity Zone jobs.
- Investigate expanding the 4% Low Income Housing Tax Credit for resilience investments.
- Promote the CT State Neighborhood Investment Act Tax Credits for use of climate resilience.

Strategy 5: Engage the foundation and philanthropic community as a funding and financing partner

Recommended Implementation Actions:

- Convene Connecticut's Community Foundation leaders to address investing in community capacity building, and annual climate adaptation training of environmental justice organizations
- Assess Connecticut's capacity for implementation and advancement of climate change initiatives at the community level and with environmental justice communities
- Launch a statewide campaign for Just Climate Change Engagement. Undertake a strategic initiative to increase available funding for Just Climate Change engagement
- Initiate a statewide pool of foundation and tax credit funds to provide matching funds for federal and state grants and funding for resilience projects.
- Continue disaster recovery and preparedness philanthropy with a long-term vision for climate resilience.
- Increase individual, crowd sourcing and corporate giving for climate resilience
- Facilitate relationship building and partnerships among the state government, foundations in state and national foundations.

The working group also began identifying funding needs to meet resiliency benchmarks and that provided by a limited set of adaptation working groups. We received preliminary feedback from the environmental equity and justice work group, input from energy efficiency and equity practitioners, the forests work group and organizations engaged in implementing nature-based solutions in our cities, rives and coast.

Robust state and federal funding and leadership and the creation of new financing mechanisms, are required to accelerate community resilience progress, stay ahead of associated climate threats and protect our most vulnerable neighbors from accelerating heat, health and flooding threats. Funding is needed to strengthen environmental justice organizations and strengthen diverse community engagement, and bring diverse leadership into designing and implementing resilience projects. Funding is needed to protect our vulnerable low- and moderate-income communities from lead and mold health threats and accelerating increases in summer heat

stress within their own homes.[5] Funding is needed to permanently protect threatened forests that serve as carbon sinks and reducing flood risks. And funding is needed to greatly accelerate the design and implementation of nature-based solutions. Urban oriented nature-based solutions include ramping up urban tree planting and urban rain gardens that green and cool our most vulnerable neighborhoods, reduce flood risks while reducing urban water pollution to further the goal of providing clean waterbodies for all, while harnessing the power of enhancing and restoring marshes, dunes and beaches and restoring rivers is essential across the state.

Robust state funding will open up access to federal grant programs, some of which now go un-tapped. An on—going state investment will create market certainties that in turn create opportunities to develop leadership, work force and jobs for disadvantaged communities. All of these projects create plentiful and largely good paying jobs. Finally, robust state funding can attract private philanthropy to support this effort and open up the potential for public-private funding that can father accelerate project and program implementation. While more discussion and planning are necessary, preliminary feedback from these limited work groups suggests that a state investing in the range of $2-3 million per year for environmental justice and community planning activities and $35 million per year for nature-based resiliency measures. Although energy is not the focus of this Working Group, we recognize that for our low-income populations that are most vulnerable to climate change, energy efficiency is of particular importance and will continue to rise with increased cooling costs as climate change drives temperatures up. The funding gap for energy efficiency is on the order of several hundred million per year (see Appendix III). No cost estimates were provided for infrastructure and land use or public health and safety, but resilience infrastructure investments alone are on the order of tens of millions per project as shown by planned projects in Bridgeport[6] and New Haven,[7] demonstrating that funding resilience and adaptation is a significant capital investment that is required to achieve transformative resiliency results that will protect all of us, especially our most vulnerable, from the ravages of climate change. In combination, we provide a wide array of funding options more than capable to providing this range of funding.

Existing Funding and Financing Mechanisms. Funding and financing mechanisms that are available or adaptable to investing in climate resilience and adaptation are not easily ranked as to which one is the best option for Connecticut. A one size fits all financing program is unlikely to be effective given the resilience project variables of owner(s), complexity, scope of work, budget, environmental conditions, stakeholders and regulatory process. A combination of funding and financing approaches and options are needed, and we have proposed many available alternatives.

Tables of existing state and federal funding and financing programs that may be used are provided in **Appendix I.** In order to facilitate the selection and effective use of these existing programs, the funding type, project cost range, term, equity impact score and funding source are summarized. A funding program's focus on pre- or post-disaster mitigation, adaptation and resilience, the type of project phase the program focuses on (e.g. planning vs. design or construction) and whether a formal cost benefit analysis method is required are also

summarized. The tables provide a brief evaluation of fairness and affordability to payers and social equity impact and if the program is eligible to make community lifelines more resilient.

Appendix II includes supplementary information on the recommendations, including a table of funding type, range, term and source. It also discusses whether the program focuses on pre or post disaster mitigation, adaptation and resilience, the type of work phase the program focuses on (e.g. planning vs. implementation) and whether a cost benefit analysis is required. Appendix II provides a summary of additional funding and financing options proposed by other work groups for the reference of GC3 members.

Appendix III provides the cost estimating methodology for working group recommendations.

Framing the Need for Climate Resilience Financing and Funding

While Connecticut has been leading the way with its forward-looking investments in recovering with resilience from Sandy, the state does not currently have a dedicated state grant or loan program for resilience projects and programs. Connecticut's neighboring states of Rhode Island and Massachusetts are dedicating bond funds towards launching resilience planning and project programs. Both of these states are also reviewing financing programs to further efforts in their state. In order to keep pace with our state's pressing needs and continue to be a leader in our region on resilience, additional funding and financing resources must be identified to move projects forward. The Financing Adaptation and Resilience Work Group was charged with identifying these sources and ensuring they promote equity and environmental justice and prioritize the protection of vulnerable communities, disproportionately impacted by the effects of climate change.

While the challenges of climate change and recommendations of the other GC3 working groups are the main driver for financing adaptation and resilience measures, our working group identified additional potential impacts of climate change on our fiscal health that further support the need to invest.

Unmet Recovery Need Following Storms

In the aftermath of Superstorm Sandy Connecticut received $159 million in funding from the U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant Disaster Recovery (CDBG-DR) for housing rehabilitation and elevation and resilient infrastructure investments. Those federal recovery funds left over more than $158 million in assessed unmet recovery needs from housing ($135,789,167) and infrastructure ($22,360,508). This unmet need included eight public housing properties (815 units) in the 100-year floodplain.[8] If Connecticut were to assess all resilient repair needs the additional need would be in the hundreds of millions of dollars. $158 million in identified unmet recovery needs after Sandy.[9] Recognizing the importance of looking ahead to future climate change needs, over $9 million of the disaster recovery funds were used for the development of 32 flood mitigation and resiliency plans.[10] Those plans and many others across the state have identified dozens of projects in coastal municipalities alone in need of funding.

Insured Assets at Great Risk from Climate Change and Extreme Weather

In 2019, global economic losses due to weather disasters totaled US $229 billion, of which US $71 billion in losses were covered by private and government-sponsored insurance.[11] Thus, the gap in protection totaled US $158 billion. The unmet needs from underinsurance are material relative to the total economic impacts of weather-related losses. For Connecticut the estimated insured value of the coastal property exposures in 2018 was $754 billion,[12] which makes the state the 6th highest of the Atlantic and Gulf states. As a percentage of a state's total insured values, Connecticut is 2nd only to Florida with coastal property making up 66% of its statewide

total insured value.[13] Climate change and severe weather events coupled with continued underinsurance to protect against losses and underinvestment to mitigate the associated risks suggest the gap between economic losses and covered losses will tend to increase over time.

Investors Want to Know Our Climate Risk

Investors and financial institutions are quickly realizing the risks climate change poses on their business models. Last month, a letter was published by Ceres Accelerator a group of more than 30 investors and financial institutions who manage over $1 trillion in assets outlining the threats of climate change to the global financial system. The letter outlines the threat saying, "the climate crisis poses a systemic threat to financial markets and the real economy, with significant disruptive consequences on asset valuations and our nation's economic stability."[14] Without regulated environmental reporting, investors today often make investment decisions with imperfect information about the climate risks of the asset into which they are investing. This imperfect information creates the risk that future climate regulation or environmental events could disproportionately impact one investment over another. In extreme cases, environmental events could cause some investments to become virtually worthless overnight. The investors in the Ceres letter worry that this potential volatility is not currently priced into the market because of the lack of required climate transparency creating serious climate vulnerability in our financial markets. The letter therefore proposes 51 regulatory suggestions – many focused on increasing environmental transparency such as mandating that companies report the physical locations of their assets and their projected greenhouse gas emissions.

A Potential Mortgage Crisis Along the Coast

Climate change poses an additional risk to the financial markets, this time by way of the residential housing market. The ability of the residential mortgage market to take down the global financial system was evident in the last financial crisis and some experts are worried that climate change is creating similar systematic risk again.[15] The typical residential mortgage has a 30-year term in order to lower monthly payments and prevent the need for a near-term capital event for homebuyers. This typical loan term creates climate uncertainty since predicting sea-level rise and other environmental impacts over the next 30 years is difficult even for sophisticated scientists let alone the average home buyer and residential underwriter. Experts worry about the percentage of these mortgages that will end up in default if assets lose significant value due to sea-level rise, floods or other environmental events. Threats of widespread climate-driven default are not just a risk to banks and other lenders, but to American taxpayers as many residential mortgages are sold to and backed by government-sponsored entities such as Fannie Mae and Freddie Mac.

State and Municipal Bond Ratings Can Be Negatively Affected by Climate Change

Climate risks are beginning to get the attention of state and municipal bond markets as well. Bond markets have traditionally offered capital to state and local governments for investment in infrastructure and services, while providing stable returns for investors. However, ratings

agencies are increasingly requiring disclosure of climate related risks from state Treasurer's offices, including in Connecticut, which has the potential to negatively impact credit ratings and increase borrowing costs for state and municipal governments across the country. Here in Connecticut, many coastal towns have high value neighborhoods, properties, and critical infrastructure that are facing increasing flood risks due to sea level rise. In towns where these assets contribute an outsized proportion to grand lists and property tax rolls, this escalating flood risk represents a financial exposure for state and municipal budgets. While much investment has been made in understanding and planning for climate change in Connecticut, a sustained commitment of technical and financial resources will be needed to solve these challenges, and our efforts will be measured against those of our peers. It's vitally important that our state and local communities demonstrate an understanding of this exposure, along with a proactive approach to addressing climate driven risks. By doing so, we'll ensure that Connecticut is a good investment into the future.

COVID-19 and Isaias

In the months since the Financing and Funding Adaptation and Resilience Working Group first began our deliberations, the State of Connecticut has endured two disasters, the public health and economic fallout of the COVID-19 pandemic and extensive power outages and property damage from Tropical Storm Isaias. Each has occurred in the context of a changing climate in Connecticut, where extreme heat and poor air quality have worsened the effects of both disasters. We are in a very different economic situation than we were just prior to the pandemic and our state is suffering greatly, and climate change has not gone away. Recommending additional funding to proactively address the impacts of climate change at a time of health and economic hardship is not something the members of this Working Group take lightly. At the same time our recovery from the pandemic and the storm is an opportunity we did not want, but it is one that we now have, to move forward with greater resilience. A recovery program that creates social and economic resilience with an equity lens for setting priorities and makes our people better prepared for climate change is a winning strategy for our near, medium and longer-term prosperity. An investment in climate resilience and social equity recognizes and addresses the underlying conditions that disproportionately worsened the effects of a pandemic and a storm on our vulnerable populations is the challenge of our time that we must courageously take on.

Findings of the Financing Adaptation and Resilience Work Group

The following sections include the working group's findings on barriers to financing, an insurance perspective on climate risks, the integration of equity with nature-based solutions, engaging foundation and philanthropic organizations, and assessing the equity of financing and funding mechanisms. These findings reflect the discussions in our meetings over the course of 2020 and highlight issues of import to the working group's membership.

Barriers to Financing Adaptation and Resilience

Communities in Connecticut face a number of obstacles and challenges to securing the necessary funding to adequately plan and implement strategies that mitigate the impacts of climate change. In order to best develop financing recommendations, an understanding of these barriers needs to be explored.

Disproportionate impacts on vulnerable communities. Research indicates that climate change related events such as flooding, heat waves, and drought, have a disproportionate effect on people of color and low-to-moderate income communities.[16] Vulnerable communities have a heightened degree of exposure to impacts and limited capacity to minimize and respond to them. Climate change poses the greatest threat to vulnerable communities that are least responsible for it, or conversely, those who have contributed the most to climate change are better positioned to protect themselves from its impacts. Vulnerable communities face historic and ongoing injustices including, but not limited to, restricted access to credit and homeownership, inadequate public and private investment, and discriminatory development-related decision-making and policy processes enabling pollution within these communities. Given this reality, climate funding and financing mechanisms for adaptation and resilience must acknowledge these equity disparities and overcome them by prioritizing approaches that reduce these inequities. Ensuring that resources (e.g., technical assistance) and public and private investment are sufficient and available to vulnerable communities, will enable them to live, learn, and work in resilient communities.

Disaster recovery funding programs are increasing the racial wealth gap of whites and people of color. A study in 2018 by Rice University and University of Pittsburgh[17] concluded that FEMA disaster recovery aid in 20 U.S. Counties increased inequality of wealth, finding that whites accumulate more wealth after natural disasters while residents of color accumulate less. Junia Howell and Jim Elliott, the research co-authors, concluded the results indicate that two major social challenges – wealth inequality and rising costs of natural disasters – are "increasingly and dynamically connected." They hope the research will encourage further examination of wealth inequality in the U.S. and development of solutions to address the problem. We recommend that Connecticut develop equity lens policies and practices that create more equitable

approaches to investing in economic development, climate adaptation, resilience, community lifelines, disaster recovery and our people to build a just and more resilient society.

Inadequate information on costs and benefits.[18] Development of cost benefit analysis for priority resilience projects is essential to accessing funding through any public or private financing mechanism. The lack of a standard model for understanding costs and benefits with regard to reducing climate risks, is a barrier to moving projects from the preliminary planning stage to "shovel ready" and ultimately to implementation. Additionally, the co-benefits of more innovative approaches to resilience, such as green infrastructure and nature-based strategies, are difficult to monetize, and therefore are not easily reflected in traditional cost/benefit decision models. For example, the benefits associated with increases in public health from urban tree cover in Connecticut cities, increased water quality due to wetland conservation, or increased public access to quality open space for recreation, may be difficult to fully quantify under existing benefit frameworks.

Incorrect pricing of risk.[19] Accurate pricing of risk creates incentives for investment in more resilient infrastructure and communities. However, FEMA's National Flood Insurance Program (NFIP) undervalues the true actuarial costs of flooding in order to keep insurance policies affordable. This distorts market signals for home mortgage lenders, buyers and sellers, and results in a public subsidy for risky development in floodplains. FEMA's modeling and pricing also relies on historical data of where floods have previously occurred; it doesn't account for increases in the frequency of flooding that are expected as a result of sea level rise and extreme precipitation. This is particularly true in Connecticut where many municipalities rely on the tax revenue from high value coastal homes and many properties are located or developed in floodplains. More transparent and clear information on the risks and costs of flooding would create value for investments in resilience, or shift development away from flood-prone areas.

Collective action challenges.[20] Even when there's agreement on the need for investments in resilience, conflicts can arise around what priorities should be funded relative to who pays and who benefits; as well as, who maintains responsibility for implementation. Consensus and coordination can be challenging, particularly for large publicly funded infrastructure projects. The Resilient Connecticut Planning Framework being developed by CIRCA, which is being funded by HUD's National Disaster Resilience Program Grant,[21] is leveraging the planning and grant administration resources of four regional Councils of Government (COG) to help build consensus for resiliency pilot projects with regional significance. The participation of the COGs in capacity building for their member municipalities has also begun in 2019 by managing the procurement and contract administration for multi-community Natural Hazard Mitigation Plans in several regions of Connecticut. The adaptive capacity required for municipal grant application writing and project management teams to access all the necessary funding from federal or state sources is likely limited in the short term, as it requires the need for cohesive partnerships. Continued and committed public dialogue at a scale appropriate for decision making is needed to maintain support from stakeholders and obtain the necessary funding for projects.

Capital budget constraints.[22] Because the returns on investment and associated risks are lesser known to investors, upfront capital can be difficult to attain, even if resiliency projects make economic sense. Since resiliency projects often provide benefits in the form of avoided future losses, the predictable revenue streams required for paying back loans for resiliency investments can be difficult to generate. Additionally, other important benefits of adaptation and resiliency projects such as enhanced water quality, open space, and healthy wetlands may be hard to monetize. Municipalities also face competing priorities to fund improvements to aging infrastructure, which can limit the availability of upfront capital needed to get projects off the ground or provide matching funds for federal grants and loans.

Limited ability to borrow funds.[23] Often entities such as municipal governments face limitations in how much debt can be issued to borrow funds for resilience. Projects often run into issues with the ability to utilize borrowed funds because an organization's borrowing capacity is directly correlated with its ability to obtain upfront capital as well as maintain sustainable revenue streams that can be used to pay back loans.

Misaligned incentives.[24,25] State and local governments often must weigh competing incentives around development and resilience. For example, municipalities have a strong incentive to increase their tax base through development, even if intensifying development in and around floodplains might exacerbate longer-term risks from climate change. Also, municipalities that invest in large-scale flood protection may not directly recoup their costs from the value of the privately-owned buildings that are protected. In addition, federal support programs, in the form of subsidized flood insurance and disaster recovery funding, can result in a disincentive for local governments to make more proactive investments in resilience; or to enact more restrictive zoning and building codes at the local level. In addition, there is often a misalignment between the government entities charged with implementing resiliency measures and the entities that receive the future savings.

Difficulty obtaining grant funding.[26] Grant funding can be, and has been, an important source of money to push resiliency efforts forward at the state, regional, and local level in Connecticut. However, significant planning and technical support capacity is needed to develop proposals, provide coordination, maintain compliance, and manage projects. Municipal staff are often overburdened with the immediate needs of local government and may not have the knowledge or capacity to fully utilize existing grant funds for projects. Grant programs often require matching funds, which can be difficult for municipalities to put forth. In the absence of matching funds and the planning/technical support capacity to leverage existing grants, Connecticut will be less competitive for these programs relative to other states, and therefore, may leave money on the table. In many aspects of resilience such as cutting-edge building technology, life-cycle analysis, health impact analysis, and community capacity building have not been advanced to be competitive for national demonstration and research funding. CIRCA has modeled an initiative that has resulted in the knowledge and capacity necessary to secure funding for sea level rise. NJIT's Center for Building Knowledge and affiliated Center for Resilient Design provides this capacity in New Jersey as does the Gulf Coast Community Design Studio in Mississippi.

The Insurance Perspective on the Financial Risk of Climate Change

Improving the nation's preparedness for climate disasters will allow the country to take a more proactive approach to building a more resilient infrastructure and mitigate the financial risk posed by climate change from an insurance perspective.

Rate to Risk. The current rating structure does not comprehensively account for the risk of losses due to extreme weather events in many coastal and other floodplain areas.

Pre-Disaster Hazard Mitigation. A critical component to building resiliency is to be prepared for and to mitigate against losses before a catastrophe occurs. Investment in mitigation and targeted incentives could improve community resiliency across the U.S.

Land Use Policies. The National Flood Insurance Program has paid millions of dollars in claims to rebuild repetitive loss properties which might otherwise have been avoided with more stringent land use policies.

Building standards. Differing existing building standards do not uniformly mitigate the risk of severe weather to property and lives. Adopting and enforcing better building codes for both new and existing property construction for increased uniformity across communities should be considered.

Take-up Rate of the National Flood Insurance Program (NFIP). It is estimated that approximately 50% of single-family homes located in the 100-year floodplains are covered by flood insurance.[27] It is also estimated that more than 29 million properties have at least a high or moderate risk of flooding and only 5 million policyholders in the NFIP. Removing any barriers to encourage a private flood market solution would be helpful.

Adherence to standards. The Federal Emergency Management Administration (FEMA) estimates that between 30% and 42% of buildings in floodplains are not in full compliance to standards.[28]

Consumer education. Potential home and property owners may not fully understand the risks to and costs of certain properties associated with damage from severe weather events before purchasing.

Lack of incentive to mitigate risk. Certain programs may not provide incentives for insureds to invest in building materials and follow building codes designed to limit the risk of damage from severe weather events.

Reducing or removing barriers in closing the gap in risk mitigation from losses resulting from severe weather events will support financing greater resilience in the face of the potential impacts of climate change. As the Insurance Capital of the World' Connecticut is uniquely situated to address these challenges going forward.

Investing in Equitable Nature-based Solutions for a Resilient Connecticut

Imperative of Equitable Nature-Based Solutions

The Connecticut Physical Climate Science Assessment Report[29] found the following historic and projected changes in precipitation that nature-based solutions can help manage.

- Annual precipitation over most of the state has increased, with the largest increase experienced in summer (since 1950) or fall (since 1895) and a slight decrease during winter.
- Projected changes in precipitation for the high CO_2 (RCP8.5) scenario show that:
    - Annual precipitation across the state is projected to increase (8.5% and 9.5%, by mid- and late-century respectively), with the greatest increase projected for winter (13.4% & 16.3% respectively) and spring (10% and 16.5% respectively) and inconclusive changes in the other two seasons.
    - Several extreme precipitation indices are projected to increase, including the number of days with more than 1 inch of precipitation (N_1inch), number of heavy precipitation days (N99), fraction of total precipitation accounted for by heavy precipitation (F99), and the maximum 1-day and 5-day precipitation (R1d, R5d), all indicating a substantial increase of flood risk by mid-century

Connecticut is also planning for up to feet of sea level rise by 2050,[30] which will worsen coastal erosion and coastal flooding.

Our communities and the land they live on are deeply intertwined, and so in order to build a safe place for Connecticut residents to live and work, the ecosystems surrounding them must be strong and healthy to survive the worsening climate crisis.

Nature-Based Solutions are a strategy to enhance communities' capacities to withstand climate disasters while promoting healthy ecosystems. Substantial state funding is required to finance the necessary projects successfully. This investment has many benefits for Connecticut residents; job creation, property value increases, insurance reduction, and significantly lessened disaster rebuilding costs. A study by Restore America's Estuaries[31] showed that between 32 to 20 jobs were created per $1 million spent as opposed to 7 to 5 jobs for road infrastructure projects or the oil and gas sector. This demonstrated that nature-based projects have a very high labor component, employing three to five times more workers.

Categories and Strategies of Nature-based Solutions

Reduce climate related stormwater flooding and pollution

Rain Gardens - Polluted stormwater rushes off impervious surfaces (pavement, etc), down pipes and out into our rivers. The DEEP recognize polluted stormwater as our greatest remaining source of water pollution.[32] The amount of runoff is directly related to impervious

surface area, therefore our oldest urban neighborhoods—often home to our most at-risk populations—are at the greatest risk.

To combat these issues, one highly visible and popular nature-based solution is to create rain gardens or bioswales. These constructed gardens collecting rain water, absorbing it back into the ground and groundwater system. They filter out pollution while greening up our neighborhoods and reduce localized urban heat islands. Many raingardens in Connecticut have been installed in disadvantaged neighborhoods, including 200 built or planned in New Haven[33] and in public spaces like Beardsley Zoo in Bridgeport.[34]

A re-entry program in New Haven is providing jobs installing these rain gardens in that underserved city for recently incarcerated members of that community. A recent study[35] with the Yale Forestry School determined that neighborhood-scale installations in New Haven reduced peak flooding events in the surrounding neighborhood.[36]

Figure 1.Senator Blumenthal, Congresswoman DeLauro and Senator Murphy pose with workers employed to install rain gardens.

Restorative Stormwater Infrastructure. Restorative stormwater infrastructure is a technique widely used in the Chesapeake Bay watershed to control large volumes of polluted stormwater in the space between large volume stormwater end of pipe and their river and stream systems. It is proving to be a highly effective way of slowing down and absorbing large volumes of polluting stormwater with the promise of reducing inland flooding peaks.[37]

Municipal Support Needed to Meet Green Infrastructure Stormwater Mandate. By 2022, our federally enforceable municipal stormwater permit (MS4) mandates that 121 municipalities in Connecticut install green infrastructure at a scale to absorb 1% of the runoff from their impervious surface.[38] This regulation will reduce peak flood flows, clean up our rivers and the sound and set us on a path toward community resilience.

Restoring Rivers, Reducing Flooding

Remove high hazard dams. Pictured below is the transformation of a hazardous dam that was removed to restore its natural landscape and water flow. A severe storm could have destroyed the dam, disastrously flooding Westville, New Haven. In place of that hazard, there is now a beautifully restored West River with a new walking trail and improved fish life.[39] There are over 400 such state-owned dams that could receive this permanent solution. We can improve sediment transport and create cooler stream temperatures, allowing threatened coldwater fish species to survive longer in the face of rising water temperatures brought on by climate change.

Figure 2. Before dam removal (left) and after dam removal (right) on the West River in the Westville neighborhood of New Haven.

This is not a theoretical concern. In May of this year, one such high hazard dam collapsed in Michigan, causing an estimated $175 million in damages.[40] Additionally, the cost of maintaining any dam is about $2,000 annually. Repairing or replacing a collapsed dam costs between $10 and $500 million dollars.

Inventory and Replace Flood Producing Undersized Road Culverts. Undersized road culverts become water blockages, causing flooding during extreme precipitation events. The first step to protecting communities from flooding is to complete a diameter and length inventory of the hundreds of culverts that are located downriver from floodplains and floodways containing significant community infrastructure. The resulting volume discharge potential of these culverts can be compared to anticipated peak flow volume associated with the waterway that flows through them. The resulting analysis will create a priority list for replacement of hazardous culverts, creating the co-benefit of increasing waterway connectivity that will allow for increased fish and wildlife migration and habitat improvement.

Building Community Coastal Resilience

Coastal communities face all three horsemen of the climate related storm apocalypse - fierce winds, coastal flooding from sea level rise and storm surge, and inland flooding from intensified precipitation events. The climate crisis will worsen these effects.

Therefore, the demand for funding to engineer and implement already identified coastal community resilience projects is enormous. Four regional Councils of Governments (COGS) and the Nature Conservancy jointly researched projects in 30 Connecticut communities. In total, they identified 400 coastal resilience projects. The vast majority of these projects remain at the conceptual level, requiring more planning for engineering and implementation. Upon completion, these projects will reduce the risk of property destruction, enhance the health of the ecosystem, and improve public amenity. Below is a map from that project of the possible projects only in the New Haven/West Haven area.[41]

Three examples of nature-based coastal resilience projects in the New Haven area:

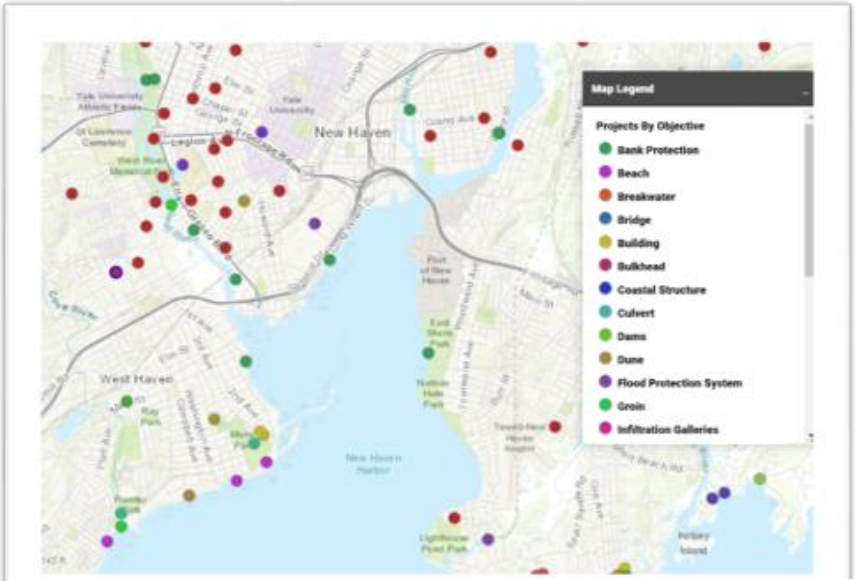

Figure 3. Identified resilience projects in the New Haven and West Haven area.

The first is the enhancement of the West Haven beach area. The natural barrier of the beach between the inhabited area and the harbor was restored and can handle bigger storm surges and sea level rise. The shoreline will erode slower, water quality will be enhanced, the habitat is improved for its wildlife, and the community has a visibly more beautiful waterfront. West Haven is a low-moderate income suburb. Its public beaches are visited and enjoyed by the wide diversity of community members from the greater New Haven area. This has funding support from the Army Corps and federal match.

Figure 4. Conceptual design for dune restoration to protect West Haven's shorefront community.

A second project that could be completed is replacing tidal marsh habitat behind Sandy Point in West Haven, using dredged materials from the dredging of New Haven Harbor's navigational channel. This project offers multiple co-benefits, including storm wave suppression for New Haven, wildlife and fish benefits, utilizing the dredged materials, and improving the area as a recreational fishing location.

A third project is a ⅔ mile shoreline erosion control project along

the East Shore Park in New Haven. This was fully funded through state resiliency project bonding, and never would have moved forward without this state funding. Upon project completion, thousands of New Haven residents will have access to new beach pockets and tidal wetlands. Currently, residents are blocked off from the dangerous conditions posed by an eroding, slumping shoreline without trails or public amenities.

Monitoring for Adaptive Management

We suggest there be a small amount of state funding designated for long term monitoring the efficacy of these nature-based projects. This data will pay dividends in providing evidence of effectiveness and improving design and approaches. Moreover, to further ensure efficacy, we recommend that the Long Island Sound Study or DEEP provide incentives and leadership in coordinating a regional community of experts on urban, coastal and riverine based nature-based projects, with a priority of including and fostering diverse leadership and participation. The river restoration working group, formed under the Long Island Sound Study has been a highly a successful model that has allowed practitioners and agency experts to learn and improve restoration techniques.

Figure 5. A group of Connecticut residents pose for a picture after planting a rain garden for their neighborhood.

Engaging the Foundation and Philanthropic Community

Communities face many potential funding challenges when it comes to resilience and adaptation – among them the inability to meet qualifications for different funding sources, limited research capacity to search for the suite of funding sources available to them, changing technology, competition with other organizations, narrowness in grant scoping, changing funding priorities, funding limitations and restrictions, and/or funding shortfalls. Foundations and the philanthropic community provide a complementary funding pathway for financing climate adaptation and resilience programs and projects that can work alone or in partnership with state and federal funding sources, but that may be particularly well suited to addressing these challenges at the community scale. In Connecticut that capacity includes:

Engaging communities of color in decision-making. Community foundations serve as local conveners and can help build coalitions at the grassroots community level.

Taking the long view on partnerships. Foundations can follow the development and implementation of regional or municipal projects over several years.

Advancing policy, knowledge and practice including testing and researching concepts and ideas for evidence-based climate action. This translational role can advance research and theory from the academy to practice and community knowledge to policy makers and researchers.

Funding planning and demonstration grants. Community and private foundations are a source of funds for nonprofits, studies, and implementation of resiliency projects (e.g. TNC's *Southeastern Connecticut Regional Resilience Guidebook*[42]). Council of Governments (COGs) can also write proposals to foundations for regional and municipal projects as well as administer them.

Providing required non-federal or non-state matching funds. Philanthropic dollars can be tapped for resilience projects that require a local match to a state or federal grant. Increasingly federal agencies are encouraging and incentivizing private matching funds (e.g. FEMA BRIC). Forming partnerships between state and foundation or philanthropic organizations for resilience projects can increase the state's competitiveness in these national award competitions.

Impact Investing. Socially minded philanthropic donors and foundations can support environmental projects for a defined return on their investment, for example as in the case of the Social Venture Partners.

Assessing the Equity of Climate Funding and Financing Mechanisms

A Process for Determining Resource Sufficiency and Availability for Climate Adaptation and Resiliency of Vulnerable Communities

Equity starts by recognizing that there are disparities and inequities in living conditions. Some communities lack resources, political power, and access to higher education, or have poor health outcomes that place low-income communities and communities of color at greater risk while limiting their capacity to adapt to climate change. Climate change poses the greatest threat to vulnerable communities that are least responsible for it, or conversely, those who have contributed the most to climate change are better positioned to protect themselves from its impacts.

The Financing Adaptation and Resiliency, and Equity and Environmental Justice Working Groups of the Governor's Council on Climate Change, are committed to continuously assessing whether existing, new, emerging, or expanded climate funding and financing mechanisms are sufficient and available to improve the needs of vulnerable communities. These mechanisms are significant, but are they enough and attainable for those who need them the most?

To that end, these Working Groups, guided by the Environmental Justice Public Participation Guidance, and Guidance on Remote Engagement for Public Participation, have developed a process to:

1. Identify an initial set of criteria to assess the funding and financing mechanisms;
2. Engage public participation from vulnerable communities to modify and determine the adequacy of the initial set of criteria over a disaster lifecycle;
3. Revise the initial set of criteria based on the inclusion and decision-making of vulnerable communities to develop equity criteria;
4. Apply the new equity criteria to discern the sufficiency of the funding and financing mechanisms; and
5. Determine how the funding and financing mechanisms can be used or modified in ways to improve or prioritize the resiliency of vulnerable communities.

The existing and new and emerging financing and funding sections of this report as well as the recommendations include evaluations of equity impacts and the prioritization of vulnerable communities, disproportionately impacted by the effects of climate change. These evaluations are based on a review of the literature in the references section of this report with particular consideration to equitable sharing of the costs of paying for resilience (for example avoiding or modifying financing programs that would be regressive) and the prioritization of vulnerable communities in funding and financing programs. The process above will further inform the evaluations included in the report to assess the equity of climate funding and financing mechanisms will take place over the fall of 2020.

Recommendations for Financing Adaptation and Resilience

Strategy 1. Build the governance structure to allow for effective and efficient financing and funding.

Funding alone does not result in implementable projects. We need a government that leads and facilitates the development of projects at the state, regional and municipal scale.

Increase Connecticut's Competitiveness for Securing Federal Funds for Resilience	
Recommended Implementation Action Description	Enhance state, regional and municipal capacity to be competitive for federal awards by reducing barriers to obtaining federal funding, including, but not limited to 1) access to support for planning, design and engineering for project feasibility and benefit-cost analysis; 2) establishing a matching funds program for federal funds; 3) creating a task force charged with identifying any barriers or needs; 4) appointing resilience coordinators in the state agency counterparts for each federal agency engaged in resilience funding; 5) advocating for federal resilience and adaptation programs; 6) create a web-based project eligibility screening tool to facilitate the process of finding grants, loans and other financing mechanisms for funding climate adaptation and resilience 6) building a network of diverse entrepreneurs, experts in cutting edge research, technologies and innovative practices. Federal programs are historically the largest source of resilience and adaptation funding in Connecticut and investing in capacity here will likely result in a good return on investment.
Implementation Entities	State agencies, CIRCA, CGA
Equity Impact[1]	(+) Use of federal funds ensures that vulnerable communities do not have to bear the costs of the project. Equity can be improved by prioritizing vulnerable communities for technical assistance in applying for federal funds, as well as reducing cost share by distressed communities. Consider developing a not-for-profit Community Design Center to maximize participatory design to advance project development in vulnerable communities.

[1] *Equity Impact:* Equity Lens Criteria is positively impacted (+), Equity Lens Criteria is positively and negatively impacted or unchanged (0), and Equity Lens Criteria is negatively impacted (-)

Scale of Funding	Tens of millions to a few hundred thousand depending on the federal funding source. FEMA BRIC can provide up to $10 million per project. NFWF LISFF maximum award of $250K.

Incentivize Private Developers and Businesses to Implement Resilience Standards and Disaster Preparedness	
Recommended Implementation Action Description	Incentives could include: 1) providing technical assistance and access to resources; 2) ensuring that any state assistance provided to businesses requires implementation of climate resilience and adaptation standards and 3) including climate risk as part of credit rating for state loans consistent with the policy of the Rhode Island Infrastructure Bank. Although private businesses are largely unregulated with respect to floodplain management statutes, for example, we know businesses suffer the impacts of climate change and natural disasters and those damages impact the people of Connecticut through the loss of jobs, services, and tax dollars to pay for recovery.
Implementation Entities	DECD and Green Bank for loan instruments. DEEP, CID and CIRCA for technical assistance.
Equity Impact	(+) Private dollar investment means that low-income communities are not paying. Small, minority-owned businesses may need additional assistance to ensure they are not disproportionately burdened by the cost of becoming resilient, but resilience investment should help with flood insurance costs and avoiding losses after a disaster. Strategies that provide the most direct benefit to local and minority business should be prioritized.
Scale of Funding	Millions of dollars in bond funds for grants and loans to businesses and private developers.

Require the Disclosure of Physical and Transitional Climate Risks at the State and Municipal Level	
Recommended Implementation Action Description	Private investors are increasingly asking that states and municipalities disclose their climate risk to investors. This disclosure should be required and made public to demonstrate the cost effectiveness of resilience and adaptation interventions. Since the benefits of resilience

	investments are realized by avoiding the costs of climate change or a natural disaster, disclosing climate risks or the cost of doing nothing, allows us to put a price on it and better value adaptation and resilience. The results of the disclosure and investing in interventions to address that risk should allow the state to unlock more capital investment dollars at better interest rates going forward and avoid losses. Both of those outcomes equate to a realized cost savings from adaptation and resilience.
Implementation Entities	Municipal governments, Office of the Treasury
Equity Impact	(0) Climate disclosures could have a near-term impact on property value, but also draw attention to where investments need to be made in vulnerable communities. The methods used in the disclosure should incorporate analysis of vulnerable communities.
Scale of Funding	A downgraded credit rating can impact all state and municipal borrowing on the scale of billions of dollars across the state.

State-funded and Initiated Infrastructure and Buildings Projects Should Lead by Example to Establish and Meet Climate Adaptation and Resilience Standards	
Recommended Implementation Action Description	Connecticut invests billions of state and federal dollars on new and upgraded infrastructure and buildings. Those investments should be leveraged to incorporate climate resiliency standards. The dollar amounts associated with regular investments in infrastructure and building far exceed any special resilience or adaptation program the state might implement, therefore incorporating resilience standards into those programs represents a large potential source of resilience funding. Currently in Connecticut most state funded or initiated infrastructure projects in the floodplain are subject to the floodplain management statute that was updated in 2018 to account for up to two feet of sea level rise by 2050. Sustainability initiatives have led to more resilient building standards for energy, but resilience should be looked at across the board to ensure building and infrastructure investments can weather and not contribute to climate change. All new construction should be minimum net-zero in operations and the state

	should implement a strategy to move towards net zero life cycle net zero carbon contribution.
Implementation Entities	CGA, DAS, DOT, DEEP
Equity Impact	(+) Ensuring that public projects in vulnerable communities incorporate resilience means those communities are better protected from the impacts of climate change. Resilience standards should focus on the protection of vulnerable communities by prohibiting poor-quality, short-term, resource -inefficient development that inevitably costs more in the long-term and negatively impacts vulnerable communities.
Scale of Funding	Billions of dollars for capital projects.

Create Central Governance Authority for the Funding, Financing and Operations of Resilience Infrastructure Projects	
Recommended Implementation Action Description	Flooding is the largest source of damage from natural disasters in Connecticut and yet our ability to finance and fund projects to address this risk is not clearly defined in any state agency's mandate. With no clear lead agency in this arena, federal dollars to fund such projects may be left on the table, despite the increasing need for them in Connecticut. Establishing authority within a state agency or the creation of a new agency or entity with this authority will make Connecticut more competitive for federal funds that are only available to the state and allow for the implementation of regional solutions. An example of a program set up this way is the NJ DEP Bureau of Flood Engineering, Flood Risk Mitigation Unit. This approach could also be taken at a local scale. In Maryland, SB457 effective July 1, 2020, now makes it possible for local governments to create a 'Resilience Authority' to issue bonds, collect fees, accept funds from local government or state government, purchase land, and own, operate and maintain resilient infrastructure projects. Existing resilience infrastructure projects addressing flood risk in Connecticut are under the authority of the municipalities where they are located.
Implementation Entities	CGA

Equity Impact	(0) Moving these projects into a more centralized process should allow for better prioritization of vulnerable communities.
Scale of Funding	Large-scale resilience infrastructure projects for flood protection can cost in the tens of millions for flood walls and pump stations, but green infrastructure solutions can be less than $1 million.

Build Outreach and Capacity and Tracking for the Increased Uptake of Flood Insurance	
Recommended Implementation Action Description	Flood insurance is an adaptation and resilience tool that is underutilized in Connecticut. Not only does flood insurance provide a means to recover from flood damage, but it also sets up a structure to incentivize behaviors that lower the risk of flooding such as elevating homes or reducing community flood risk. Savings on flood insurance can be used as a financing mechanism to pay for adaptation and resilience measures. In order to ensure Connecticut takes full advantage of flood insurance coverage: 1) Connecticut should partner with FEMA to ensure the Risk Rating 2.0 Program is rolled out and implemented effectively in order to avoid coverage disruption. 2) Consideration should be given to developing a community flood insurance program as an additional layer of coverage alongside the National Flood Insurance Program (NFIP). Such a program, creatively designed using insurance vehicles, could ultimately protect the community by providing a greater level of flood insurance uptake for business owners and residents. 3) Assistance should be provided to communities to help them qualify for greater flood credits under the FEMA Community Rating System (CRS) program. This is a 10-point program where the more credits a community qualifies for, the greater the savings on a FEMA NFIP flood insurance policy. The credits are derived from actions that lower the risk of flooding across a community thereby providing a financial benefit from reduced premiums and a reduced risk of damage from floods for residents and business owners within those communities. 4) Connecticut should partner with FEMA on communicating the benefits of flood insurance and in attaining FEMA's moonshot goal in Connecticut of doubling the number of properties covered by flood insurance by 2022

Implementation Entities	DEEP, CID, DESPP
Equity Impact	(0) Moving these projects into a more centralized process should allow for better prioritization of vulnerable communities.
Scale of Funding	The CRS program provides discounts ranging from 5% to 45% of premiums. WestCOG estimated a total savings in premiums of nearly $1 million annually, if a regional CRS program was implemented to move all of the municipalities in WestCOG into the CRS program at the introductory level with a 5% savings. In 2017, New Haven achieved a class 7 CRS rating, the highest in the state, affording their city's NFIP policyholders a 15% discount on insurance.

Strategy 2. Generate Revenue Sources to Pay for Resilience Projects and Programs

Resilience and adaptation projects and programs savings come in the form of avoided losses making it fundamentally more difficult to fund the financing of loans or bonds for these projects with financial losses avoided or savings from lower costs of insurance. In order to finance projects, it is necessary to establish other revenue sources for the funds that will save the State and municipalities dollars in avoided loss while also maintaining or improving bond ratings

Establish Resilience Fees to Provide Revenue Sources for Resilience and Adaptation Funding and a Source of Matching Funds for Grants	
Recommended Implementation Action Description	Fees can be used as a source of direct funding for projects or as a mechanism to pay off a bond in place of taxes. Fees may be collected in a number of ways, including, but not limited to transactions, use of systems, licensing, permitting and sales. Considerations for determining the appropriate vehicle for a fee assessment may include linking the fee to the individuals or sectors benefiting from the outcomes of the fee or assessing the fee against individuals or sectors that contribute to the problem the fee addresses. In either case, resilience fee revenues should be tied to establishing an appropriation to implement resilience projects and programs and should not be diverted for other purposes. Examples include: **Transaction Fee - Municipal Buyer's Conveyance Fee.** Legislative authority needed to allow municipalities to establish a local conveyance fee that would be paid for by the real estate buyer at the time of property transfer. Enable, but do not require, municipalities to establish a progressive conveyance fee (e.g., up to 1% for buyers of real property on the portion of a sale in excess of $150,000) for a dedicated adaptation and resilience fund for projects and programs that address impacts climate change impacts inn that municipality. *Note this idea was first proposed specifically for a Community Conservation Fund related to adaptation, stewardship and resilience. **User Fee - Wastewater Use Fee.** A fee to be assessed on a monthly basis for individual homes or equivalent dwelling units as users of a wastewater system. In Maryland, a fee was assessed for the creation of the Chesapeake Bay Restoration program. The $5 monthly fee generates an estimated $100 million per year. The fee collection allows

	for a financial hardship fee waiver. It was also referred to as the 'flush tax.' **Licensing and Permitting Fees – Built environment.** Connecticut requires licensure in many sectors related to the built environment. The built environment exacerbates climate impacts and benefits from adaptation and resilience projects and programs. **Retail fees –** Built environment. Similar to licensing and permitting fees on the built environment, product sales for the built environment are another potentially appropriate area for fees. Sales tax could be increased on products and used for resilience and adaptation programs.
Implementation Entities	CGA for legislative authority in most cases
Equity Impact	(0) Fees can be designed to be more or less equitable. They will raise costs for those paying the fee and therefore ability to pay should be accounted for in any fee assessment. Fees will always be assessed on a much smaller subset of the state's population than funding resilience through a bond backed by state income taxes, for example, which means that special care must be taken to ensure the group singled out is not unfairly or unjustly burdened by that cost.
Scale of Funding	Depends on the amount of the fee and how often it is assessed, over what population and for what projects.

Establish Carbon Fee to Provide Revenue Sources for Resilience and Adaptation Funding	
Recommended Implementation Action Description	Implement an economy-wide cost of carbon that assesses the carbon content of fossil fuels and sets a price per ton of carbon emitted. A carbon price policy represents the greatest opportunity to raise revenue while reducing economy-wide GHG emissions. A carbon fee charges a fee based on the amount of CO_2 emissions released through fossil fuel combustion. Revenues generated from a carbon fee can be reinvested in climate change adaptation and mitigation efforts. A state-wide carbon fee could support bond financing and ties the costs of adaptation and resilience to the cause of climate change, human-induced carbon emissions. Mechanisms for pricing carbon include

	the Transportation and Climate Initiative[43] or fees of carbon products like the Petroleum Gross Earnings Tax.[44]
Implementation Entities	CGA
Equity Impact	(0) The carbon fee (and all fees) would have to address the ability to pay so that it does not disproportionately burden vulnerable communities. This issue could be addressed either on the front end of who pays the fee or on the back end on how the revenue generated is distributed, for example, by providing rebates to vulnerable populations. An additional benefit of a carbon fee over a sewer use fee, for example, is that the fees are distributed over a much broader population, but broadening who pays also means potentially disproportionately subsidizing those who benefit.
Scale of Funding	Hundreds of millions of dollars

Increase Funding for Community Investment Act (CIA)	
Recommended Implementation Action Description	Legislative authority to increase the surcharge on local recording fee from $40 to $50. Increasing fee by $10 would add an estimated $5 million per year to the total CIA account. This additional funding could be dedicated to nature-based solutions, as well as a staff position at CT DEEP or a contracted non-profit to administer the program. This fee could be used to integrate further resiliency efforts into existing categories and/or create a new resiliency account as a new program could be easier to administer.
Implementation Entities	CGA, state agencies to administer funds
Equity Impact	(0) A nominal recording fee is not likely to have a large impact on vulnerable communities.
Scale of Funding	$5 million per year

Create Guidance to Use Tax Increment Financing (TIF) Districts for Resilience	
Recommended Implementation Action Description	TIF districts are authorized for use in Connecticut, but should be promoted as a tool for financing resilience projects in the state. TIF Districts use increased market value of property and capital improvements that come from public-private partnership investments to a specific geographic area to fund that investment. A TIF district captures the future net economic value increase from the

	investment through district-level taxes or fees. TIF districts could, in principle, finance neighborhood-scale resilience projects. The current statutory authority does not explicitly call out the use of TIF districts for resilience projects, but municipal bond funds in Stamford, CT, backed by a TIF district, funded improvements in Mill River Park, which restored the natural floodplain of the Mill River and reduced the risk of flooding downtown. The funding for the TIF district comes solely from new economic development increasing aggregate property values, rather than an increase in property value from the resilience improvement. Bundling resilience improvements in with economic development may be a more reliable funding source than relying on property value increases from resilience investments alone.
Implementation Entities	DECD and non-profit Connecticut Main Street Center for technical assistance
Equity Impact	(-) TIF Districts are one of the most narrowly-defined financing mechanisms for who pays. If a resilience improvement is needed in a neighborhood entirely made up of a low-income vulnerable population, then raising their property values in order to collect more taxes is a negative impact. However, the use of TIF Districts can be a more equitable solution in areas where those who benefit and have the resources to pay for that benefit do so. Public monies can be prioritized for vulnerable communities with less ability to pay. A challenge here is that solely relying on TIF Districts for resilience improvements means that wealthy areas will be the only neighborhoods to see an increase in resilience.
Scale of Funding	A TIF-backed bond could be in the millions of dollars range, but the amount of funding from the bond to a resilience project is more likely in the hundreds of thousands of dollars range.

Approve Legislation to Allow Municipalities Statewide to Form Stormwater Utilities to Fund Resilient Infrastructure	
Recommended Implementation Action Description	CT Gen Stat § 22a-497 established the creation of a municipal stormwater authority pilot program, but limited the municipalities who could participate. The recommendation is to modify the statute so that all

	municipalities have the legal authority to establish a stormwater utility. Stormwater utilities collect fees from all property owners. Fees may be based on sewer use or amount of impervious cover (impervious cover leads to greater stormwater runoff). The fees fund infrastructure investments to reduce stormwater runoff, which may include grey infrastructure solutions such as pumps or upgraded sewers and green infrastructure like rain gardens and bioswales, that allow for stormwater to soak into the ground rather than becoming runoff. The motivation for stormwater utilities in Connecticut to date has been tied to the MS4 permit, which is primarily about water quality, however, stormwater backups and runoff cause flooding, which also makes stormwater infrastructure investments a resilience strategy.
Implementation Entities	CGA, municipalities, DEEP
Equity Impact	(+) In 2019 the City of New London became the first and only municipality to adopt a stormwater utility. In order to address stormwater runoff, a stormwater utility fee was more equitable than raising property taxes because all real property owners, even those exempted from property taxes, pay the fee based on amount of impervious cover. In 2019, CGA HB7408 proposed an expansion of the existing stormwater pilot program and mandated that a fee be assessed on all real property and required considerations that would promote green infrastructure solutions by tying fees to areas of impervious cover. Property owners could reduce their fees by reducing impervious cover, which has the benefit of reduced flooding in vulnerable communities and with green infrastructure solutions like rain gardens or tree boxes, a dual benefit of cleaner air and cooler temperatures as impervious cover like pavement contributes to heat island effects in urban areas. There is however a concern that upland municipalities may not have an incentive under this structure to address stormwater generated within their boundaries that impacts more vulnerable communities where this runoff causes flooding. Stormwater is a local and regional challenge.
Scale of Funding	In New London the stormwater utility fee would generate an estimated $1.3 million per year in revenue.[45]

Approve Legislation for Property Assessed Resiliency with C-PACE	
Recommended Implementation Action Description	C-PACE is an innovative financing solution from the Connecticut Green Bank ("Green Bank") that makes clean energy improvements to properties safe, accessible, and affordable. The recommendation of Property Assessed Resiliency would be included within and expand the purview of the C-PACE public policy to include resiliency as a qualifying commercial real property measure. The Green Bank would consult with DEEP and CIRCA to develop program eligibility criteria for financing of resilience improvements that are consistent with state environmental resource protection and community resiliency goals, and the program would require each resiliency project to conduct a resiliency study on the qualifying commercial real property that assesses the resiliency costs savings from such improvements over the useful life of the measures.
Implementation Entities	Green Bank, DEEP, CIRCA and the private sector
Equity Impact	(+) C-PACE is applicable to nearly all non-residential buildings, including non-profits and houses of worship that can offer critical social services and strengthen social bonds, both of which contribute to community resilience. 135 of 169 cities and towns have opted into C-PACE in Connecticut. Only 4 of DECD designated distressed communities have not yet opted into C-PACE.
Scale of Funding	Hundreds of millions of dollars invested.

Promote the Bundling of Climate Resilience and Adaptation Measures into Energy Savings Performance Contracts (ESPCs)	
Recommended Implementation Action Description	Owners of properties with large energy usage can hire an Energy Services Company (ESCO) and an Owner's Representative to assist the owner in procuring financing, installation, operation, and maintenance of building retrofits involving onsite energy generation, energy efficiency, and water conservation related capital improvements. The ESCO can access long-term financing methods such as Tax-Exempt Lease Purchase (TELP) commercial loan or bonds for these projects with limited or no up-front costs to the owner. Cash flow to the ESCO from the energy savings pays down the financing over the term of the TELP. Resilience measures related to energy such as the installation of microgrids or battery storage can be integrated into the capital projects financed by an ESPC.
Implementation Entities	DEEP
Equity Impact	(0) This mode of financing is not likely to be available to low income vulnerable communities, but the increased resilience of public infrastructure utilities can benefit vulnerable communities, if they are serviced by those facilities.
Scale of Funding	Millions of dollars in energy resilience measures.

Strategy 3. Supply Grants, Matching Funds for Federal Grants and Loans to Fund Resilience Projects and Programs

Connecticut needs to establish a program of grants and loans at the state level to fund projects. These programs are largely supported by state bond financing backed by taxpayer dollars, but funds could also be backed by the revenue-generating mechanisms in Strategy 2.

Create an Environmental Infrastructure Bank	
Recommended Implementation Action Description	Expand purview of Green Bank to include Environmental Infrastructure. The recommendation of Environmental Infrastructure Bank would be included within and expand the purview of the Green Bank public policy to include "environmental infrastructure" as an area of investment. Environmental infrastructure would include, but not be limited to climate adaptation and resiliency as proposed to the state legislature in 2020. The policy would create an Environmental Infrastructure Fund, separate from the Clean Energy and Regional Greenhouse Gas Initiative funds overseen by the Green Bank – as well as the Clean Water and Clean Drinking Water funds administered by DEEP and the Office of the Treasurer– and be able to access potential federal resources that the Green Bank has been advocating for. The policy would enable the Green Bank to use its existing bonding authority to finance environmental infrastructure projects, and provide low-cost financing and credit enhancement mechanisms for projects and technologies. For the past several years, the Connecticut Green Bank has been advocating for the creation of a National Climate Bank that would provide low-cost and long-term capital from the federal government to states to finance projects to confront climate change (i.e., mitigation and adaptation projects). As part of the $1.5 trillion green infrastructure bill passed by the House of Representatives (i.e., Moving Forward Act"), a $20 billion "Clean Energy and Sustainability Accelerator" was included, with a focus on GHG emission reductions, job creation and just transition, and increasing investment in vulnerable communities.
Implementation Entities	Green Bank, DEEP, DECD, CGA
Equity Impact	(+) As a loan program focused on environmental infrastructure the bank has the potential to fund public works projects to benefit vulnerable communities. These loans would still have to be paid off and therefore taxes or

	a fee structure would be needed as a revenue source (see Strategy 2) and the payback mechanism would need to be equitable. The Green Bank is a national model when it comes to vulnerable communities. Its focus of increasing and accelerating investment in distressed and vulnerable communities serves as a foundation to the National Climate Bank.
Scale of Funding	Loans could range is size depending on the project type.

Provide State General Obligation Bonds as Green Bonds for Financing for Resilience and Adaptation Programs and Projects and Matching Funds for Federal Grants	
Recommended Implementation Action Description	The bond should fund a program to allocate resilience funds on a competitive basis to projects and allow administrative and program delivery costs, as is the case with comparable programs at the federal level (e.g. FEMA Pre-Disaster Mitigation program (now called BRIC) and the HUD CDBG-DR program). The program could be administered by the state or another entity approved and overseen by the state. State agencies, municipalities, non-profits and academic institutions should be eligible to receive funds through the program. The bond funds could be allocated to public engagement, planning and educational programs as well as built projects. The funds should be utilized to meet non-federal match in applications for federal grant awards. State bonds are the mechanism by which our neighboring states of Massachusetts, Rhode Island, and New York are funding their resilience programs. In Connecticut, the Microgrid grants program provides a precedent for a resilience grant program backed by state bond funds. UConn CIRCA successfully carried out the Municipal Resilience Grants and Matching Funds programs backed by a settlement with the state.
Implementation Entities	CGA, OPM, Bond Commissions
Equity Impact	(+) General obligation bonds spread the cost over all state taxpayers and therefore represents a minimal incremental cost to any individual person, lowering the potential for a disproportionate impact on a low-income vulnerable community. The bond funds could be prioritized for programs and projects supporting vulnerable communities without asking those communities to pay for the entire

	cost and could also potentially be used for administrative costs for the community managing the project.
Scale of Funding	Tens to hundreds of millions for the bond. Massachusetts passed a bond bill in 2018 including $500 million for adaptation projects and programs that is funding their resilience planning and action grants program. On July 29 Rhode Island announced $4.4 million for projects from their Climate Resilience Funds backed by the Green Economy and Clean Water Bond. New York proposed, and the state legislature passed, a $3 billion "Restore Mother Nature" bond including funds for resilience initiatives to be placed on the November ballot, but it has since been removed by the state budget director citing COVID-19 impacts.

Implement the 10% of the State Revolving Loan Funds that can be Used to Finance Green Infrastructure, Flood Control and Microgrid Projects	
Recommended Implementation Action Description	The State has the ability to utilize up to 10% of revolving loan funds to support green infrastructure, flood control and microgrid projects. The state should fully fund the revolving loan fund programs and provide technical assistance to municipalities to expand the use of green infrastructure and flood resilience projects. Green infrastructure approaches have been shown to be effective in reducing flooding and erosion, and they offer co-benefits like cooling in cities, reducing stormwater pollutants and increasing public access to the shoreline and surface waters. The 10% allocation could be leveraged for matching funds to federal resilience grants targeting nature-based solutions to mitigate natural disasters such as the FEMA Building Resilient Infrastructure and Communities (BRIC) program offering $500 million in funds for these projects nationwide in FY20.
Implementation Entities	DEEP
Equity Impact	(+) Green infrastructure improvements offer co-benefits to communities of removing impervious cover and greening urban landscapes, which can clean air and reduce heat island effects. The current green infrastructure set aside in the Clean Water Fund prioritizes combined sewer communities often located in low-income neighborhoods. The green infrastructure set aside offers a higher grant to

	loan ratio to lower the repayment costs. If paired with federal grant funds for a nature-based solution, then a much smaller amount of loan would be needed to fully fund a project.
Scale of Funding	Tens of millions of dollars.

Incentivize Connecticut's Insurance Industry to Promote and Grow the Catastrophe Bond Market and Pilot a Resilience Bond Program	
Recommended Implementation Action Description	Resilience bonds modify the existing catastrophe bond insurance market to capture the savings from a lowered risk of insurance payouts and then use that value as rebates to invest in resilient infrastructure projects. Catastrophe bonds bring together insurance and investment. Investors in the bonds receive payments with interest unless a catastrophe, like a hurricane with storm surge, occurs and the principal invested is then used to cover losses. These bonds are usually short term on the order of 3 to 4 years. In 2013, one year after Superstorm Sandy, the New York MTA purchased a $200 million parametric catastrophe bond to insure themselves against losses and provide funds to make repairs in the event of a storm surge.
Implementation Entities	Municipalities or private entities
Equity Impact	(0) Catastrophe bonds are focused on insurance coverage for large private or municipal entities.
Scale of Funding	Hundreds of millions in payout in the event of a natural disaster.

Revolving Loan Fund for 1-6 Family Affordable Housing Purchase and Rehabilitation	
Recommended Implementation Action Description	A loan product that allows both purchase and rehabilitation is required to stop the unjust deterioration in cities, inner ring suburbs and rural communities. A revolving loan pool should be established with funding by DOH, CHFA and others that would be administered by CDFIs (Community Development Financial Institutions) and Community Development Corporations (CDCs) to finance purchase and subsequent rehabilitation (including undertaking resilience measures) of functionally obsolescent and deteriorated housing. Loans would be

	taken out following the completion of rehabilitation by traditional homebuyer and other mortgage financing. The loan program would be supported by technical assistance through a newly established Community Design Center (CDC) that would work in partnership with CDCs.
Implementation Entities	DOH, CHFA, CDFIs and CDCs
Equity Impact	(+) Let's not lose the embedded energy, affordable housing stock, and financial equity accumulated largely by Black and other People of Color in our existing 1-6 family building stock due to functional obsolescence, impacts of climate change and deterioration. Preservation of walkable communities is especially important to climate change goals as is avoiding the need to build expensive and energy-intensive replacement housing. There is a desperate need for easy-to-use resource for financing, grant funds and technical assistance for rehabilitation of these properties. Due to gaps in existing financing additional loan products supported by technical assistance are required to serve the needs of middle-income as well as low/moderate-income families.
Scale of Funding	Hundreds of thousands on a per project basis.

Financing for Resilient Housing Upgrades Including Construction of ADUs and Home Elevation	
Recommended Implementation Action Description	COVID-19 has brought to focus the needs for families, caregivers, and others to live in close proximity. Connecticut should provide the financing and regulatory relief for housing to meet this need. In most cases this will reduce transportation, increase resilience and reduce energy use for housing as well as meet social justice goals. This product would also be useful to allow existing homeowners to make the necessary repairs for sale of their home to a next generation of homeowners. Building a second mortgage product for repairs, upgrades, addition of ADUs and resilience measures supported by technical assistance should be achievable. Existing solar and energy conservation program administered by the Green Banks can serve as a model for this initiative. After Superstorm Sandy, Connecticut capitalized the Shore Up Connecticut low interest loan program using state bond funds, run by the Housing Development Fund, for homeowners and small businesses in the coastal floodplain to elevate

	structures and utilities. Only 12 loans were given out at that time, but it was released at a time when federal recovery dollars were also widely available. The state might consider reupping this program or partnering with private banks to promote loan programs for resilience retrofits for private homeowners.
Implementation Entities	DOH, CHFA, Municipalities and CGA
Equity Impact	(+) A low-interest second mortgage product could be developed to diversify housing stock and increase resilience. Higher density housing with ADUs would make more affordable options in Connecticut municipalities and create a more resilient community.
Scale of Funding	Hundreds of thousands on a per project basis.

Strategy 4. Investigate the use of tax credit programs to incentivize the private sector to invest in community resilience.

Tax credits have been successful in spurring development and may also be used to incentivize or attract investment in resilience projects.

Investigate the Use of the New Market Tax Credit, Opportunity Zones, and the 4% Low-Income Housing Tax Credit for Resilience Investments	
Recommended Implementation Action Description	All three of these tax credit programs are utilized in Connecticut to promote investment in low-income communities. Although there is no explicit integration of climate resilience in these tax credit programs, community resilience initiatives or investments could be integrated into projects or programs built with tax credits. Connecticut should investigate opportunities to maximize resilience within its tax credit programs due to their focus on low-income communities who are also disproportionately impacted by climate change. As an Opportunity Zone example, the Norfolk Solar II QOZ Fund in Virginia is now available to commercial investors. The investment partners have identified an estimated $150 million worth of potential sites needing 90 MW of solar energy. These private investment partners expect to create over 200 clean energy jobs in Opportunity Zones.
Implementation Entities	DECD, DOH, CHFA, Municipalities
Equity Impact	(+) The above tax credit programs are used to promote economic development in low-income communities where resilience investments are also needed. If appropriate projects can be identified to utilize these programs, then they are likely to benefit vulnerable communities.
Scale of Funding	Tax credits can be worth millions of dollars to investors but also impact tax revenue to the state.

Strategy 5. Engage the Foundation and Philanthropic Community as a Funding and Financing Partner

The foundation and philanthropic community in Connecticut, with its network of community partners, is uniquely positioned to take an important role in both meeting climate change goals and building the capacity to implement social, racial and environmental justice:

Engage the Foundation and Philanthropic Community as a Funding and Financing Partner	
Recommended Implementation Action Description	**Convene Connecticut's Community Foundation Leaders** in an intensive workshop to address investing in community capacity building, and annual climate adaptation training of environmental justice organizations with the goal of establishing an ongoing partnering relationship and Working Group among the stakeholders. **Assess Connecticut's capacity for implementation and advancement of climate change initiatives at the community level and with environmental justice communities**, to be coordinated with the recently initiated assessment of housing needs, including capacity required for implementation and the established need for increasing inclusiveness. **Launch a statewide campaign for Just Climate Change Engagement.** This effort could integrate the approaches from the Frameworks Institute. Undertake a strategic initiative to increase available funding for Just Climate Change engagement including developing a new grant pool specific to addressing identified gaps, developing new contributors, providing additional giving platforms, leveraging existing resources such as the Neighborhood Assistance Act and advancing knowledge in the next stage of implementation (i.e. building social capital and sequestering carbon). **Initiate a statewide pool of foundation and tax credit funds to provide matching funds for federal and state grants and funding for resilience projects**. Managing a fund like this requires significant coordination with grantees and funding organizations who all have different needs and timelines, but the proof of concept has been

	done through the Matching Funds Program at CIRCA and the Community Match Program at Sustainable CT. **Continue disaster recovery and preparedness philanthropy with a long-term vision for climate resilience.** Community foundations can quickly raise funds from their donors and constituents to distribute emergency funds in response to a disaster, such as a hurricane. Community foundations may consider setting aside or channeling their disaster fundraising towards resilience projects with a lasting impact, similar to the direction the federal government is taking with the 6% set aside of disaster appropriations for pre-disaster mitigation and the formation of the HUD CDBG Mitigation Program also funded by disaster appropriations. **Increase individual, crowd sourcing and corporate giving** for climate resilience and related environmental justice projects. **Promote the CT state Neighborhood Investment Act Tax Credits for Resilience.** Corporations can contribute $150K to programs up to through the CT state Neighborhood Investment Act Tax Credits that would be useful for regional or municipal programs. These tax credits can be married to foundation grants and/or used as matching funds for larger federal grants or for funding smaller projects outright. **Facilitate the relationship building and partnerships among the state government, foundations in our state and national foundations.** In addition to community foundations, the State should seek deep, long-term affiliation with national foundations for significant grants for projects, or a series of projects, to support early stages of project conception and development.
Implementation Entities	State agencies

Equity Impact	(0) Today, many of these programs do not fund Environmental Justice activities. This may be an opportunity to engage with community and private foundations to proactively fund Environmental Justice, Climate Justice and environmental health programs. This would also create an opportunity for donors to support these programs through traditional philanthropic organizations.
Scale of Funding	Philanthropic foundations can be a good opportunity for funding to build community awareness and support as well as begin the development of a project to position it for other funding sources.

Appendix I. Existing Financing and Funding Mechanisms for Climate Adaptation and Resilience

Table 1 and 2 below contain list of the existing financing and funding program at the state and federal level that have clear links to adaptation and resilience. In order to facilitate the use of these existing programs, this report tabulates the funding type, range, term and source. It also discusses whether the program focuses on pre or post disaster mitigation, adaptation and resilience, they type of work phase the program focuses on (e.g. planning vs. implementation) and whether a cost benefit analysis is required. The tables provide a brief evaluation of fairness and equity and how the program connects to community lifelines. Community lifelines are referenced by the US Federal Emergency Management Agency in their Building Resilient Infrastructure and Communities Program that is the largest source of federal grant funding for resilience and adaptation projects outside of funds provided due to a declared disaster. Community lifelines enable the continuous operation of critical government and business functions and are essential to human health and safety or economic security. FEMA identifies community lifelines as safety and security; food, water, shelter; health and medical; energy; communications; transportation; and hazardous material. Although clearly framed from an emergency response perspective, community lifelines provide a useful evaluation of whether a funding or financing program is addressing these critical needs.

Legend for Table 1 and 2

Key Screening Factors of Existing Funding Mechanisms Table

Funding Type: (L) Loan, (G) Grant, (B) Bond, (I) Insurance Backed Security, (CE) Credit Enhancement

Funding Range: 1000's $, ex. 5,000= 5,000,000 unless otherwise stated as $5 million

Funding Term: in years, ex. 1, 3, 5, 10, 20 or more

Federal Funding Source: (+) Dedicated not subject to annual committee appropriations, (-) Discretionary, subject to annual committee appropriations

Federal Programs Administered by State: Examples FEMA, HUD, NOAA, (Yes/No)

Pre- or Post- Disaster Mitigation, Adaptation, Resilience: Pre, Post, Both

Work Phase: (P) Planning/Capacity Building, (FS) Feasibility Study, (D) Design, Permit, (C) Construction, (R) Retrofit/Renovate (O) Operate & Maintain, (Z) Land Use Zoning Ordinance (BC) Building Code

Cost Benefit Analysis Required: (Yes/No)

Fairness to Payers: Less Ability to Pay Payers pay less or none, and High Ability to Pay Payers pay more (+), All Payers pay the same but may result in insufficient fund amount to meet total need (0) , Less Ability to Pay Payers pay unaffordable amount and High Ability to Pay Payers pay none or insufficient amount (-)

Equity Impact: Equity Lens Criteria is positively impacted (+), Equity Lens Criteria is positively and negatively impacted or unchanged (0), and Equity Lens Criteria is negatively impacted (-)

Community Lifelines Impact: One or more of 7 Community Lifelines are positively impacted for increased resilience (+), One or more of 7 Community Lifelines are stabilized but resilience is unchanged (0), One or more of & Community Lifelines are destabilized or negatively impacted for resilience (-)

Table 1. Existing State Financing and Funding Mechanisms for Climate Adaptation and Resilience

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	**Match % (0-100)**	**Funding Range (1000s)/Term Period/Dedicated (+) or Discretionary Funding Source (-)**	**Projects Completed in CT? /Administered by State of CT**	**Pre- or Post-Disaster Mitigation Adaptation Resilience**	**Work Phase**	**Cost Benefit Analysis Required**	**Fairness to Payers**	**Equity Impact/Community Lifelines Impact**
Green Bonds (CT Green Bank, State Bond Commission, Municipalities/Political Subdivisions), (B)	NA	Limited by debt caps, 15, 20, 30 years or more terms. (-)	Yes/Yes	Both	All	No	0	(-) distressed communities may have lower bond rating and pay higher rate; (+) green projects could be prioritized for community lifelines; (+) Green Bank prioritizes equity impact.
General Obligation Bonds (State Bond Commission, Municipalities/ Political Subdivisions/(B)	NA	Limited by debt caps 15, 20, 30 years or more terms. (-)	Yes/Yes	Both	All	No	0	(-) distressed communities may have lower bond rating and pay higher rate (+) green projects funded could be prioritized for community lifelines

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	**Match % (0-100)**	**Funding Range (1000s)/Term Period/Dedicated (+) or Discretionary Funding Source (-)**	**Projects Completed in CT? /Administered by State of CT**	**Pre- or Post-Disaster Mitigation Adaptation Resilience**	**Work Phase**	**Cost Benefit Analysis Required**	**Fairness to Payers**	**Equity Impact/Community Lifelines Impact**
Public Private Partnerships (CT Green Bank and State)	NA	C-PACE, nearly $175 million of capital invested - supporting over 300 projects, over $285 million of estimated avoided energy costs over the life of the projects, and projects located in 135 participating cities and towns	Yes/No	Both	All	Yes	0	(+/+) green projects could be prioritized for community lifelines and equity. Currently, only 4 of DECD designated distressed communities have not yet opted into C-PACE.
CIRCA Municipal Grant Program (CIRCA) (G) Discontinued 2017	25%	Grant awards between $20 and $50 depending on annual funds available (-)	Yes/Yes	Both	P, FS, D, Z	No	0	(+) Equity impact considered when ranking proposals (+) community lifelines eligible
Microgrids Grants (DEEP), (G) CT Green Bank (L)	NA	$18 million in 2013 for 9 Projects, Grant Round in 2019 on hold	Yes/Yes	Both	All except O	No	0	(0) Awards do not consider equity (+) Microgrids protect power supply for

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	**Match % (0-100)**	**Funding Range (1000s)/Term Period/Dedicated (+) or Discretionary Funding Source (-)**	**Projects Completed in CT? /Administered by State of CT**	**Pre- or Post-Disaster Mitigation Adaptation Resilience**	**Work Phase**	**Cost Benefit Analysis Required**	**Fairness to Payers**	**Equity Impact/Community Lifelines Impact**
								community lifelines
Tax Increment Financing (TIF) Municipalities and Political Subdivisions	100%	Project dependent, (-)	Yes/No	Both	All	No	0	(0) Can finance affordable housing, based on raising property values, gentrification possible (0) can improve or increase need for community lifelines

Table 2. Existing State Financing and Funding Mechanisms for Climate Adaptation and Resilience

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	**Match % (0-100)**	**Funding Range (1000s)/Term Period/Dedicated (+) or Discretionary Funding Source (-)**	**Projects Completed in CT? /Administered by State of CT**	**Pre- or Post-Disaster Mitigation Adaptation Resilience**	**Work Phase**	**Cost Benefit Analysis Required**	**Fairness to Payers**	**Equity Impact/Community Lifelines Impact**
Regional Conservation Partnership Program (USDA NRCS), (G)	50%	Grant awards between $250 and $10,000 for up to 5-year terms. $1.5 billion total funding dedicated over 5-year period.	No/No	Both	All	No	0	(+) Subawards typically limited to property owners below AGI thresholds.
Watershed Operations and Flood Prevention Program (USDA NRCS)	0%	$197 million is discretionary funding and $47 million in mandatory funding in FY19	Yes/No	Both	All	Yes	0	(+) Equity impact considered when ranking proposals.
Long Island Sound Futures Fund (National Fish & Wildlife Foundation/USEPA)	50%	Grant awards between $20 and $500 for up to 2-year terms	Yes/No	Both	All	No	0	(0) Grant awards do not consider equity issues.

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	**Match % (0-100)**	**Funding Range (1000s)/Term Period/Dedicated (+) or Discretionary Funding Source (-)**	**Projects Completed in CT? /Administered by State of CT**	**Pre- or Post-Disaster Mitigation Adaptation Resilience**	**Work Phase**	**Cost Benefit Analysis Required**	**Fairness to Payers**	**Equity Impact/Community Lifelines Impact**
National Fish and Wildlife Federation Resilient Communities (Wells Fargo), (G)	50%	Grant awards between $100 and $500 for up to 2-year terms. $3 million dedicated for 2020.	Unknown/No	Both	All	No	0	(+) Equity impact considered when ranking proposals.
Emergency Watershed Protection-Floodplain Easements (USDA NRCS), (G)	100%	$435 million in FY19 and 20 Supplementary Funds, assigned to natural disasters	Yes/No	Post	All except O	No	0	(1) Awards do not consider equity
Rural Development-Water & Environmental Program (USDA), (G&L)	100%	$153 million awarded in FY20	Yes/No	Both	All except O	No	0	(+) Awards based on median household income
Building Resilient Infrastructure and Communities (BRIC) (FEMA) (G)	10% to 25%	Up to 6% annual set aside from post disaster grant funding (+) State, territory and tribal set	Yes as Pre-Disaster Mitigation Program /No	Pre (must have a national declared disaster in past 7 years	All except O	Yes, including eligible mitigation projects that are	0	(+) focus on community lifelines and partnerships with shared responsibilities and lower 10% match for small impoverished

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	Match % (0-100)	Funding Range (1000s)/Term Period/Dedicated (+) or Discretionary Funding Source (-)	Projects Completed in CT? /Administered by State of CT	Pre- or Post-Disaster Mitigation Adaptation Resilience	Work Phase	Cost Benefit Analysis Required	Fairness to Payers	Equity Impact/Community Lifelines Impact
		asides and national competition for balance, large and small grants, 3 years with extensions for large multi-phase projects, $350-500 million expected in FY20		from application date)		cost-effective based on FEMA's pre-calculated benefits (see FEMA pre-calculated benefits table for more details)		communities (pop. less than 3000 and average income less than 80% national average) some projects eligible for environmental and social benefits in BCA
Flood Mitigation Assistance (FMA) (FEMA) (G)	0%-SRL 10%-RL 25%-HMA	$160 million total in FY20, (-) $ 4 million for Project Scoping or $600,000 for Sub-applicant for Community scale projects and relocations $70 million for Community	Yes/Yes	Pre	All except O and FS	Yes, including eligible mitigation projects that are cost-effective based on FEMA's pre-	0	(+) FY20 Policy favors neighborhood buy-outs for relocations. Priority for federal share of up to $250,000 for projects at single family dwelling units and less than $750,000 for acquisitions of SFDUs

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	Match % (0-100)	Funding Range (1000s)/Term Period/Dedicated (+) or Discretionary Funding Source (-)	Projects Completed in CT? /Administered by State of CT	Pre- or Post-Disaster Mitigation Adaptation Resilience	Work Phase	Cost Benefit Analysis Required	Fairness to Payers	Equity Impact/Community Lifelines Impact
		Flood Mitigation Projects ($30 million per project cap) $86 million for Technical Assistance, Flood Hazard Mitigation Planning and Individual Flood Mitigation Projects				calculated benefits (see FEMA pre-calculated benefits table for more details)		
Hazard Mitigation Grant Program (HMGP) (FEMA) (G)	25%	Allocated using a "sliding scale" formula based on the percentage of funds spent on FEMA Public Assistance and Individual Assistance for each Presidentially declared disaster. The formula	Yes/Yes	Post	All except O and FS per HMP	Yes, including eligible mitigation projects that are cost-effective based on FEMA's pre-calculated benefits	0	(-) A study in 2018 by Rice University and University of Pittsburgh concluded that FEMA disaster recovery aid in 20 U.S. Counties increased inequality of wealth, finding that whites accumulate more wealth after natural disasters while

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	Match % (0-100)	Funding Range (1000s)/Term Period/Dedicated (+) or Discretionary Funding Source (-)	Projects Completed in CT? /Administered by State of CT	Pre- or Post-Disaster Mitigation Adaptation Resilience	Work Phase	Cost Benefit Analysis Required	Fairness to Payers	Equity Impact/Community Lifelines Impact
		provides up to 15% of the first $2 billion of estimated aggregate amounts of disaster assistance, up to 10% for amounts between $2 billion and $10 billion, and 7.5% for amounts between $10 billion and $35.333 billion. (-)				(see FEMA pre-calculated benefits table for more details)		residents of color accumulate less.
Public Assistance (PA) 406 Mitigation (FEMA) (G)	75%	Funding amounts based on the damage estimates for each Presidentially declared disaster	Yes/Yes	Post	D, C, R	Yes	0	(-) A study in 2018 by Rice University and University of Pittsburgh concluded that FEMA disaster recovery aid in 20 U.S. Counties increased inequality of wealth, finding that whites

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	Match % (0-100)	Funding Range (1000s)/Term Period/Dedicated (+) or Discretionary Funding Source (-)	Projects Completed in CT? /Administered by State of CT	Pre- or Post-Disaster Mitigation Adaptation Resilience	Work Phase	Cost Benefit Analysis Required	Fairness to Payers	Equity Impact/Community Lifelines Impact
								accumulate more wealth after natural disasters while residents of color accumulate less.
National and Emergency Coastal Resilience Fund (NOAA/NFWF) (G)	100%	$31 million FY20 (-) no maximum but $2 million restoration average cap	Unknown/No	Both	All	No	0	+ capacity building grants
Clean Water State Revolving Fund (EPA) (L) (G)	Repayment starts 12 months after construction, can match with FEMA and USDA	30-year low interest loans with subsidies as grants, small to large loans, $158 million was largest loan in 2019,	Yes/Yes	N/A	All	No	0	+ technical assistance and capacity building

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	**Match % (0-100)**	**Funding Range (1000s)/Term Period/Dedicated (+) or Discretionary Funding Source (-)**	**Projects Completed in CT? /Administered by State of CT**	**Pre- or Post-Disaster Mitigation Adaptation Resilience**	**Work Phase**	**Cost Benefit Analysis Required**	**Fairness to Payers**	**Equity Impact/Community Lifelines Impact**
Community Development Block Grant (CDBG) (HUD) (G)	0% Grant can be used For FEMA 25% match	Grants for municipalities in areas with 51% Low/Moderate Income Population, allocated by formula in CT totaled 13.4 million in 2019	Yes/Yes	Both	All except O	No	+	+ supports community lifeline facilities and emergency protective measures for infectious diseases
CDBG – Disaster Recovery (HUD) (G)	0%	Grants for Community Resilience Plans and Mitigation	Yes/Yes	Post	All except O	Yes	+	+ supports community engagement low/moderate income areas, community lifelines
CDBG- Section 108 Loan Guarantees (HUD) (L) (CE)	N/A	$300 million loan commitment ceiling, match with New Markets Tax Credits (NMTC), Low Income Housing Tax Credits (LIHTC), and Opportunity	Unknown/Unknown	Both	All except O	No	+	+ supports community engagement low/moderate income areas, economic development and community lifelines

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	**Match % (0-100)**	**Funding Range (1000s)/Term Period/Dedicated (+) or Discretionary Funding Source (-)**	**Projects Completed in CT? /Administered by State of CT**	**Pre- or Post-Disaster Mitigation Adaptation Resilience**	**Work Phase**	**Cost Benefit Analysis Required**	**Fairness to Payers**	**Equity Impact/Community Lifelines Impact**
		Zone equity investments.						
Flood Resilience and Risk Reduction (G)	Varies 50%	$1.8billion funding in FY20, project specific funding for levees, dams, dune restoration for riverine and coastal flood resiliency	Proposed in New Haven/No	Post typically, Pre is allowed	All except O	Yes BCR method under revision	0	0 protect community lifelines and areas of national economic benefits, environmental benefits
Better Utilizing Investments to Leverage Development (DOT) (G)	20%	$1 billion annually since 2009	Unknown/Yes	Both	All except C, O	No	0	0 transportation community lifeline is primary benefit, special credit for rural transit for economic development
Section 103 Hurricane and Storm Damage Reduction (USACE)	100% (Feasibility Study) 65% (Final Design and	Maximum Federal Cost for planning, design and construction of any single project is $10 Million. Feasibility Study is 100% funded	Yes/Yes	Both	FS, D, C, R	Yes	0	0

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	**Match % (0-100)**	**Funding Range (1000s)/Term Period/Dedicated (+) or Discretionary Funding Source (-)**	**Projects Completed in CT? /Administered by State of CT**	**Pre- or Post-Disaster Mitigation Adaptation Resilience**	**Work Phase**	**Cost Benefit Analysis Required**	**Fairness to Payers**	**Equity Impact/Community Lifelines Impact**
	Construction)	up to $100k. Costs over $100k are 50/50.						
Section 204 Ecosystem Restoration in Connection with Dredging	100% (Feasibility Study) 65% (Final Design and Construction)	$10 Million Maximum per project	Yes/Yes	Both	FS, D, C, R	Yes	0	0
Section 205 Flood Damage Reduction Projects	100% (Feasibility Study) 65% (Final Design and Construction)	Maximum Federal Cost for planning, design and construction of any single project is $10 Million. Feasibility Study is 100% funded up to $100k. Costs over $100k are 50/50.	Yes/Yes	Both	FS, D, C, R	Yes	0	0

Appendix II. Supplementary Information on Recommended Financing and Funding Strategies

Appendix II

Table 1. Further analysis of the elements of proposed new or enhanced financing and funding recommendations

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	Match % (0-100)	Funding Range /Term Period/Dedicated (+) or Discretionary Funding Source (-)	Projects Completed in CT? /Administered by State of CT	Pre- or Post- Disaster Mitigation Adaptation Resilience	CBA	Fairness to Payers	work phase	Equity Impact/Community Lifelines Impact	Capital	Match	Local fund
Local Authorizations Stormwater Authority Authorization	0%		no/no	both	yes	(+)			high	yes	yes
Local conveyance tax authorization											

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	Match % (0-100)	Funding Range /Term Period/Dedicated (+) or Discretionary Funding Source (-)	Projects Completed in CT? /Administered by State of CT	Pre- or Post- Disaster Mitigation Adaptation Resilience	CBA	Fairness to Payers	work phase	Equity Impact/Community Lifelines Impact	Capital	Match	Local fund
State Funding: New Appropriation - State bonds for nature-based solutions and urban tree and forest protection (bonding)	0%	$70 million	yes/yes	both	yes	(+)			low	no	no
Water/resilience flush tax (tax)	0%	$50-70 million from $60 per household "flush tax "	no/no	pre	yes	(+)			high	yes	yes
catastrophe bonds (bonding)	0%	(+)	no/no	post	yes	(+)			low	no	no
Shore up Connecticut (L)	0%	$10,000 to $300,000 with 15 year term, 2.75 % fixed interest rate (2.894% APR) 1% origination fee (+)	yes/no	post	no	0			low	yes	no

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	Match % (0-100)	Funding Range /Term Period/Dedicated (+) or Discretionary Funding Source (-)	Projects Completed in CT? /Administered by State of CT	Pre- or Post- Disaster Mitigation Adaptation Resilience	CBA	Fairness to Payers	work phase	Equity Impact/Community Lifelines Impact	Capital	Match	Local fund
Resilience Energy Saving Performance (FEMP) (G)	0%	(+)	no/no	pre	yes	0			low	no	no
Clean water revolving loans (L)	20%		yes/yes	pre	yes	0			high	requires 20%	yes
drinking water revolving loans (L)	20%	ct. deadline for 2021 past	yes/yes	pre	yes	0			high	requires 20%	yes
"no net loss"	0%	Developers/state make payments to mitigation fund for unavoidable forest conversion and other natural lands - “no-net-loss of forest” laws (+)	no/no	both	yes	0			low	no	yes

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	Match % (0-100)	Funding Range /Term Period/Dedicated (+) or Discretionary Funding Source (-)	Projects Completed in CT? /Administered by State of CT	Pre- or Post- Disaster Mitigation Adaptation Resilience	CBA	Fairness to Payers	work phase	Equity Impact/Community Lifelines Impact	Capital	Match	Local fund
"no net loss"	0%	Developers/state make payments to a mitigation fund for unavoidable conversion of forest and other natural lands - "no-net-loss of forest" laws (+)	no/no	both	yes	0			low	no	yes
enable municipalities to institute buyer conveyance fee	0%		no/no	both	yes	(+)			high	yes	yes
Urban Forest Carbon Credit	0%		no/no	both	yes	0			high	yes	yes
General sales tax increase	0%	74.8million for increase of general sales tax by .125% (from 6.35% – 6.475%)	yes/yes	both	yes	0			high	yes	no

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	Match % (0-100)	Funding Range /Term Period/Dedicated (+) or Discretionary Funding Source (-)	Projects Completed in CT? /Administered by State of CT	Pre- or Post- Disaster Mitigation Adaptation Resilience	CBA	Fairness to Payers	work phase	Equity Impact/Community Lifelines Impact	Capital	Match	Local fund
Enhance existing land conservation programs - more specific climate-related criteria into selection of projects/level of funding	0%	increase from $3-7.5 million to $25 million for OSWA and RNHT and $10 million for the Recreational Trails Program. (+)	yes/yes	pre	yes	0			low	no	yes
Increase funding for Community Investment Act (CIA)	0%	$1.5 million for an increase from $40 to $50 on local recording fee	yes/yes	pre	yes	0			low	no	yes
Mandate use of existing state revolving funds set aside for land conservation	0%	Up to 10% of SRF can be used for land conservation	yes/yes	pre	no	(+)			low	no	yes

Funding Mechanism (Funding Source/Agency) Grant (G) Loan (L)	Match % (0-100)	Funding Range /Term Period/Dedicated (+) or Discretionary Funding Source (-)	Projects Completed in CT? /Administered by State of CT	Pre- or Post- Disaster Mitigation Adaptation Resilience	CBA	Fairness to Payers	work phase	Equity Impact/Community Lifelines Impact	Capital	Match	Local fund
Expand RGGI funds for forest land conservation	0%	Invest CO2 allowance auctions to fund DEEP land protection effort or other environmental projects (+)	yes/yes	pre	yes	0			low	no	yes
Expand corporate tax credit for donations/bargain sale of open space to individuals for land that meets certain climate mitigation criteria and/or for forest carbon services	0%		no/no	pre	yes	0			low	no	no
collaboration with private non-profits	0%	collaborate with non-profits to offset costs of administration	no/no	both	yes	0			low	no	no

Elaborations on and rationales for a few of these funding streams:

Triple the Petroleum Products Gross Earnings Tax and dedicate the new 16.2 cent per gallon rate for climate mitigation and adaptation purposes.

Annual funding per year: approximate $520 million

Rationale: Burning of petroleum products is the root cause of global warming. Imposing an additional tax to pay for measures needed to make the State and its most vulnerable citizens safe in the face of climate change when petroleum costs are at historic lows. For background on tax see OLR white paper.[2]

Resilience Water Fund (Flush Tax)

We propose a new water resilience fund that would be created through a flush tax, modeled after one such that is levied by Maryland. This would consist of a $60 fee for any household or business that owns and operates at least one toilet facility. The estimated revenue could be between $50 and $70 million dollars per annually.

This project has high capitalization potential. Low and moderate income households could be made eligible for a partial or full state income tax reduction from the tax as to not burden those who should not be expected to spare that 60 dollars. This tax would offer an assured stream of funds that would be used to ensure a higher quality of water in Connecticut, returning the investment back to Connecticut residents. We recommend that this tax be directed to all other resilience project needs, with an emphasis on projects with high community equity benefits.

[2] https://www.cga.ct.gov/2018/rpt/pdf/2018-R-0054.pdf

Appendix III. Cost Estimates for Adaptation and Resilience Strategies

Equity and Environmental Justice Working Group

Equitable Energy Efficiency Goals and Funding to Create Safe and Warm Homes
*Although the primary charge to the Financing Resilience Work Group was to identify funding and financing resources for adaptation and resilience rather than reducing carbon emissions, the work group recognizes that especially for low- and moderate-income households energy efficiency represents a resilience pathway by lowering cost burdens and improving public health. Energy efficiency also directly addresses climate resiliency particularly with rising cooling costs as temperatures warm.

Funding need: $544,350,000/year (see calculations below)

Building Environmental Justice and Community Capacity

Funding need: $2,835,000/year (see calculations below)

Building Community Capacity to Administer and Implement State and Federal Grants

Funding need: $6 million/year for a 10-year program (see calculations below)

Financing Adaptation and Resilience Working Group

Nature Based Solutions with Equity Focus

Funding need: $35 million resilience fund

Working and Natural Lands Working Group

Protecting Forests (Forests Subgroup)

Funding need: $35 million/year in state funding & $10 million in local revenues through a mixture of local authorizations to permit (not mandate) local municipalities to provide matching share.

Science and Technology Working Group

No financial estimates provided

Infrastructure and Land Use Adaptation Working Group

No financial estimates provided

Public Health Working Group

No financial estimates provided

Wetlands Working Group

No financial estimates provided

Rivers Working Group

No financial estimates provided

<u>Details on Cost Estimates/Funding Needs from Working Groups</u>

<u>Forests Working Lands Subgroup</u>

Top Priority Recommended Actions and Possible Funding Mechanisms
Enhance Existing Programs

1. Enhance existing land conservation programs, incorporating more specific climate-related criteria into selection of projects/level of funding
    a. Historically got **$3 - $7.5 million** in bond authorization, but realistically requires about **$25 million** in annual bond authorizations for OSWA and RNHT and **$10 million** for the Recreational Trails Program.
2. Increase funding for Community Investment Act (CIA)
    a. Increase Surcharge on local recording fee from **$40 to $50**
    b. Add **$1.5 million** for urban forest improvements and DEEP staff salaries to administer these programs
3. Expand Urban Green and Community Garden Program to include urban forest improvement projects
    a. DEEP's Urban Green and Community Garden Program already provides assistance enhancing urban spaces
    b. Expand this to **specifically fund urban forest improvement projects**
4. Utilize a portion of state revolving funds for land conservation/green infrastructure projects
    a. **Up to 10%** of SRF may be used for this purpose
    b. Need legislative action to **mandate** the use of that 10% for green infrastructure
    c. In 2019, S.B. No. 927 proposed the Green Bank should expand its investment into green infrastructure
5. Expand use of Regional Greenhouse Gas Initiative (RGGI) funds to forest land conservation
    a. **Invest CO2 allowance auctions** to fund DEEP land protection projects, scientific studies related to forest science, (including an assessment of current forest

management practices and policies and impacts on climate mitigation goals), forest stewardship, public education and outreach programs promoting the importance of resilient forests, amongst many other possibilities relating to land sector activities.

New Revenue Options

Tax and Other Incentives

1. **Expand corporate tax credit** for donations/bargain sale of open space to individuals for land that meets certain climate mitigation criteria and/or for forest carbon services
    a. Final report will include criteria for such climate mitigation actions
    b. Consider transferable tax credits for conservation easement donations
2. Enable Compensatory Mitigation for state and local projects
    a. Developers make payments to a mitigation fund if unavoidable conversion of forest and other natural lands occurs - **"no-net-loss of forest" laws**
    b. Apply to private and public disturbance of land
3. Increase Connecticut sales tax to fund new land conservation efforts and other outdoor reaction and land stewardship projects
    a. Increase general sales tax by **.125% (from 6.35% – 6.475%)**
    b. This increase would cost families an average of **$47** per year
    c. Generate an additional estimated **$78.4 million** for land conservation
    d. Alternative: allocate percentage of existing sales tax to such activities
4. **Carbon Tax**
    a. Tax on power plants, developments and any other projects (even sustainable energy infrastructure projects) responsible for greenhouse gas emissions or CO2 storage losses
    b. Revenue used to pay for climate initiatives such as forest carbon mitigation
    c. If other subgroups are suggesting a carbon tax, then a portion of the revenue should go to investments in natural climate solutions.
5. Allow municipalities to establish a **local buyer's conveyance fee** in order to create a local fund for climate resilience and mitigation projects

Private - Public Partnership Pilot Programs

1. Using the New York State Conservation Partnership Program as a model, Connecticut would partner with a private non-profit organization to offer competitive matching grants to qualified Connecticut land trusts for support in administering land conservation projects.
    a. **State bonding** - could be packaged as part of a larger green bond program.
    b. DEEP personal services agreements with NGOs to provide direct services to municipalities and other NGOs for grant writing, grant administration, and project administration.
2. Urban Forest Carbon Credit Project

Value carbon credit (metric tons of CO2 captured in urban forests) including quantifiable ecosystem and other co-benefits associated with urban trees (stormwater reduction, air quality, energy savings, health and equity benefits, as well as employment); value the carbon

revenue; establish a value per year; and sell the carbon credits to garner funding for local preservation, planting, restoration and other projects.

Equitable Energy Efficiency Goals and Funding to Create Safe and Warm Homes

Although the primary charge to the Financing Resilience Work Group was to identify funding and financing resources for adaptation and resilience rather than reducing carbon emissions, the work group recognizes that especially for low- and moderate-income households energy efficiency represents a resilience pathway by lowering cost burdens and improving public health.

Estimated total cost: **824,350,000/year**

We currently generate approximately **$280,000,000** in energy efficiency funds. This leaves a balance of **$544,350,000** in new revenue needed each year[3].

Breakdown of Outcomes from Investments:

1. Provide safe and warm home program benefits. **By 2030, provide benefits to 85% of owner occupied low/moderate households with income under $50,000 (186,000 households) and 50% of renter low and moderate income households (140,000 households[4]). With this total goal of 326,000 low and moderate income households over a 9 year period**, the program will require no net outlay of household income while receiving the full services identified below. Cost: **$543,0000,0000 /year, an estimated $15,000 per household[5]**
2. Continue to provide the balance of households with current level of services, but coordinate and improve service delivery: Cost: $250,000/year
3. Program marketing: market planning and implementation to penetrate these markets and increase demand. Cost: **$750,000/year**
4. Financing arm needed to supply this demand. Cost: **$350,000/year**
5. Safe and home service delivery to include:
    a. A single application format that is consistent with other LOM income services utilized by the largest segment of this target customer audience;
    b. Safe home services to include:

[3] The energy efficiency rate on electric bills generates approximately $260 million/year. Funds from the Regional Greenhouse Gas Initiative generate approximately $20 million/year.

[4] Number of household calculation derived from 2013 data supplied in: https://www.ct.gov/opm/lib/opm/hhs/interagency_council_on_affordable_housing/meeting_2013_12-03/final-report-11-12-13.pdf See: p. 20, Table 3.3.

[5] To reach 326,000 households over 9 years the program must average a penetration of 36,222 households/year. At an average cost of $15,000/household that equals $543,330,000/year

i. Safe home services: installation of the most cost-effective services needed to remove human health threats found in the home, including: lead, asbestos, mold, antiquated knob and tube electrical.
ii. Energy Efficiency with solar on top
    1. a consistent DEEP energy efficiency program that incorporates the best of our weatherization/HES programs with follow up DEEP building envelope measures subsidized and financed so that LOM income households are guaranteed continual utility savings
    2. Evaluation and installation of dual system high efficiency electric heat pumps where feasible;
    3. Replacement of old, inefficient refrigeration, clothes dryers or other high energy use, inefficient household appliances;
    4. Combine as necessary subsidization of roof replacement with renewable rooftop solar opportunities.

Building Environmental Justice and Community Capacity

6. Developing Community Capacity - Environmental Justice, Grant and project administration and community delivery services: **Total Need: $2,835,000 every year.** Provide training for environmental justice residents on climate justice (CJ) so they can engage meaningfully in the GC3 process.
    i. **$500k** for 1-2 years of effort; needed every (5) years.
    ii. 6-10 **$50-$75K** grants to community organizations to provide 40 hours of CJ training to 20 people every (5) years for a total **estimated $360k** investment.
    iii. Aimed at training low income POC primarily, but can include low income whites or disabled individuals
b. Establish a permanent environmental justice presence across all Connecticut
    i. **$2 million** annually spread across multiple organizations
    ii. DEEP or preferably private foundation will administer funds
c. Energy efficiency and renewable energy programs run by community-based organizations who can do outreach in culturally appropriate manners and with understanding complex housing assistance for residents which require coordination between multiple LMI assistance programs.

d. Total of **$475k**, distributed on a country by county basis
e. **$75k** to New Haven, Fairfield, and Hartford.
f. **$50k** to other 4 counties
g. Annual statewide EJ mapping and posting on a website: **$10K**/year

Building Community Capacity to Administer and Implement State and Federal Grants

7. GRANT AND PROJECT ADMINISTRATIVE CAPACITY BUILDING AND SUPPORT: **$6 MILLION/YEAR** 10 year program to train and support grant writing and administration, finance oversight and project management capacity focused on distressed municipalities. Eligible entities should include NGOs, municipalities and COGs who are committed to diverse workforce development and regional project delivery.

   Grant amounts needed per year to fund: 30 total mix of municipalities, NGOs, COGs:
   Average grants of **$200,000/year x 30 = $6 million/year x 10 years**
   Or
   $60 million over 10 years

<u>Nature Based Solutions with Equity Focus</u>

$35 Million Resilience Fund:

As previously stated, 400 coastal projects in 30 communities have been identified, and demonstrate the need for a large scale investment to begin to ensure the resiliency of Connecticut. This program must be administered in a flexible and effective manner. Any legislative authorization must allow for third party administration and incorporate an allowable administrative fee of 10%. In the recent past (2014-2017) the DEEP was authorized to expend $40 million in general obligation bonds for these purposes and was unable to locate internal resources necessary to administer these funds as a competitive community grant program. We must incubate the best techniques as well as quality workforce opportunities, and regional implementation. Specifically, we must authorize NGO's and COGs to be eligible to apply for grants with municipal support.

We propose the establishment of a resiliency fund offering **$35 million/year** in competitive grants available to municipalities and NGOs and COGs with municipal support that:

1. Provide 66% of the funding as outright grants to distressed LOM income communities
2. Provide matching grants for MS4 communities across the state to meet key impervious surface treatment, stormwater pollution reduction and peak flood reduction targets;

3. Evaluate and prioritize the replacement of road culverts causing river/upstream flooding;
4. Provide engineering and project implementation funds to match federal programs for coastal and riverine nature-based solutions such as shoreline softening, tidal marsh enhancement, removal of high hazard dams, nature-based flood storage solutions.

Key outcomes by 2030:

a. 72 coastal resilience and riverine resilience competitive projects engineered or completed with 45 in distressed communities.[6]
b. 19.8 billion gallons of flood peaking and polluted stormwater is captured and absorbed into the groundwater system in 121 municipalities across the state - the equivalent of preventing and cleaning up 1,833 Exxon Valdez oil tankers filled with stormwater polluted flood waters from reaching our rivers and streams each year.[7]
c. Prioritization for DOT replacement of flood causing undersized culverts throughout the State and engineering guidelines for their replacement in hand. A dozen of the worst of these flood causing projects are replaced costing $2 million per year.

Protecting Forests:

Forests play a crucial role in carbon emission reduction and climate risk mitigation. Trees store carbon from the atmosphere, while also absorbing and preventing rain water from eroding and flooding downstream systems. Forests are one of nature's best protectors of downstream urbanized development in floodplains from peak flooding. To protect our communities from hazardous and costly flood events, the forests of Connecticut must increase protections for these critical ecosystems and the rejuvenate of deforested areas, especially urban communities.

Funding needs:

- **$35 million/year** in state funding
- **$10 million** in local revenues through a mixture of local authorizations to permit (not mandate) local municipalities to provide matching share

Key Outcomes:

[6] $28 million/year for 9 years (FY 2022-FY 2030) yields a total of $252 million in state funding. This should be matched by a combination of federal funds (for low/moderate income communities) and local funds on a 1:1 ratio. Thus the total project pool grows to $504 million. At an average cost of $7 million/project, this should fund a total of 72 projects over the 9 year period.

[7] municipal support for MS4 program: $10 million/year

- Urban forestry: plant 720,000 trees in distressed neighborhoods in coordination with parallel rain garden efforts.[8]
- Permanently protect 2,500 new acres of forest across the state.[9]

[8] Set aside $8 million/year in state funding or $72 million from FY 2022-FY 2030. At an estimated cost of $100/tree total cost in planting and 2 year maintenance and replacement, these funds will fund the planting of 720,000 urban trees.

[9] A total investment of $38 million/year over 9 years will yield $342 million between FY 2022 and FY 2030. At an average of $14,000/acre, this should purchase and permanently protect $25,000 acres of forest and ecologically valuable land.

References and Endnotes

[1] https://portal.ct.gov/-/media/Office-of-the-Governor/Executive-Orders/Lamont-Executive-Orders/Executive-Order-No-3.pdf
[2] https://www.greenribboncommission.org/wp-content/uploads/2018/04/Financing-Climate-Resilience-April-2018.pdf
[3] http://climatechange.ri.gov/documents/resilientrhody18.pdf
[4] http://nsglc.olemiss.edu/sglpj/vol8no1/3-french-et-al.pdf
[5] Our aging housing stock that is home to many of our low and moderate most vulnerable neighbors provides a tremendous opportunity for cost-effective energy efficiency investments. These neighborhoods, facing multiple life stressors, require consistent community-based outreach to engage them in weatherization and energy efficiency programs. Moreover, these services are denied twice as often in these neighborhoods when compared to middle income areas because of higher incidence of mold, asbestos or lead found in typically older homes. Finally, these aging structures typically lack both significant insulation and air conditioning, thereby increasing health related extreme heat exposure that we are living into due to climate change. Investing in a healthy, comfortable housing stock for our most vulnerable by eliminating environmental threats, providing deep energy efficiency services and investing in electric high efficiency heating/cooling heat pump split systems is a quadruple win: (a) adaptation: by protecting our most vulnerable populations from accelerating heat exposure(b) community health:
[6] https://portal.ct.gov/DOH/DOH/Additional-program-pages/NDRC-Phase-2-Application
[7] https://www.nae.usace.army.mil/Missions/Projects-Topics/Fairfield-and-New-Haven-Counties-Coastal-Storm-Risk-Management-Feasibility-Study/
[8] https://portal.ct.gov/-/media/DOH/NDRC_Applications/ExhibitDNeedph1pdf.pdf
[9] 3 Conn. Inst. For Resilience and Climate Adaptation, et al., SAFR Connecticut Connections: NDRC Phase 1 Application (June 22, 2015), available at http://web9.uits.uconn.edu/circa/ndrc/pubs/FinalSAFRConnecticutConnectionsJune22.pdf
[10] https://portal.ct.gov/DOH/DOH/Sandy-Pages/Sandy-Programs/Planning/Planning-Tranche-One and https://portal.ct.gov/DOH/DOH/Sandy-Pages/Sandy-Programs/Planning/Planning-Tranche-Two
[11] REFERENCE NEEDED. General reference https://www.ncdc.noaa.gov/billions/
[12] https://www.air-worldwide.com/Models/Tropical-Cyclone/The-Coastline-at-Risk/
[13] Ibid
[14] https://www.nytimes.com/2020/07/21/climate/investors-climate-threat-regulators.html
[15] https://www.nytimes.com/2020/06/19/climate/climate-seas-30-year-mortgage.html
[16] https://nca2018.globalchange.gov/chapter/14/
[17] http://www.news.pitt.edu/news/natural-disasters-fema-aid-widen-racial-wealth-gap
[18] https://www.greenribboncommission.org/wp-content/uploads/2018/04/Financing-Climate-Resilience-April-2018.pdf
[19] Ibid
[20] Ibid
[21] https://resilientconnecticut.uconn.edu/
[22] Ibid
[23] http://climatechange.ri.gov/documents/resilientrhody18.pdf
[24] Ibid
[25] https://www.greenribboncommission.org/wp-content/uploads/2018/04/Financing-Climate-Resilience-April-2018.pdf
[26] http://climatechange.ri.gov/documents/resilientrhody18.pdf
[27] REFERENCE NEEDED
[28] REFERENCE NEEDED
[29] https://circa.uconn.edu/wp-content/uploads/sites/1618/2019/08/CTPCSAR-Aug2019.pdf
[30] https://portal.ct.gov/DEEP/Coastal-Resources/Coastal-Hazards/Sea-Level-Rise
[31] https://estuaries.org/wp-content/uploads/2019/01/Jobs-and-Dollars_2011.pdf
[32] https://portal.ct.gov/DEEP/Water-Regulating-and-Discharges/Stormwater/Stormwater-Management
[3333] https://www.newhavenindependent.org/index.php/archives/entry/bioswale_city/
[34] https://circa.uconn.edu/wp-content/uploads/sites/1618/2018/12/Beardsley-Zoo-Final-Report.pdf
[35] https://hixon.yale.edu/practice/bioswales/green-infrastructure-projects

[36] https://environment.yale.edu/news/article/community-green-infrastructure-initiative-earns-national-environmental-award-/
[37] https://pubs.usgs.gov/fs/2008/3101/HoganFS_Final_01-23-09.pdf
[38] https://nemo.uconn.edu/ms4/basics/towns-institutions.htm
[39] https://www.nhregister.com/connecticut/article/New-Haven-s-West-River-flowing-freely-again-in-11348649.php
[40] https://www.freep.com/story/news/local/michigan/2020/06/08/midland-flood-damage-major-disaster-whitmer/5321673002/
[41] https://maps.coastalresilience.org/connecticut/
[42] https://media.wix.com/ugd/29a871_649289678e664394bad4cf77b144a25b.pdf
[43] https://www.transportationandclimate.org/
[44] https://www.cga.ct.gov/2018/rpt/pdf/2018-R-0054.pdf
[45] http://www.ci.new-london.ct.us/filestorage/7495/7995/New_London_Stormwater_Authority_Pilot_Program_Report_Final_%281%29.pdf