

CATALYZING INVESTMENT WITH A NATIONAL CLIMATE BANK: LESSONS FROM SUBNATIONAL GREEN BANKS



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Achieving net-zero emissions will require large scale change across all sectors of the economy, and efforts to drive this transition are intensifying. Over the past several years, through the Climate Innovation 2050 initiative, the Center for Climate and Energy Solutions (C2ES) has engaged closely with leading companies across diverse sectors to examine challenges and solutions to decarbonizing the U.S. economy by 2050. As we laid out in *Getting to Zero: A U.S. Climate Agenda*, reaching net-zero will require this large-scale change, but it will also require us to address a number of discrete and urgent challenges. To inform policy-makers considering these near- and long-term questions, C2ES launched a series of “Closer Look” briefs to investigate important facets of the decarbonization challenge, focusing on key technologies, critical policy instruments, and cross-sectoral challenges. These briefs will explore policy implications and outline key steps needed to reach net-zero by mid-century.

EXECUTIVE SUMMARY

Developing, deploying, and scaling low- and zero-carbon technologies in time to avoid the worst impacts of climate change—while also bolstering resilience to climate impacts—will require an unprecedented infusion of capital in a very short time frame. Over the past decade, green banks have emerged as a critical mechanism to strategically deploy public financial resources in ways that can leverage private capital and accelerate the transition to a decarbonized, resilient future.

Surveying a decade’s worth of state and local green bank successes and challenges can illuminate some design elements that states, localities, and the federal

government should consider as green banks mature and as new green banks are established to accelerate clean energy deployment. Key considerations include organizational structure, initial capitalization and ongoing funding, operational scope, types of financing products and services, and impact metrics.

- **Scope:** Depending on the green bank, eligible projects could be in the residential, commercial, industrial, agricultural, nonprofit, municipal, or other sectors. While some banks have very narrow energy-related objectives, others have scopes far broader than energy. In addition to investing

in clean and renewable energy deployment and in energy efficiency, some green banks have started to address key areas that will require increased attention as decarbonization advances, including accelerating clean energy uptake among low- and moderate-income households, strengthening climate resilience, broadening the scope of infrastructure and technology lending, and facilitating the transition for communities dependent on emitting industries.

- **Structure:** Green banks have been structured as public, quasi-public, or nonprofit entities.
- **Funding:** Green banks have typically utilized funds provided by some combination of public, private, and philanthropic sources, though as green bank models and portfolios have evolved and expanded, they have also begun to secure funding from an even broader range of sources and at a scale beyond what is typically available at the state or local level.
- **Products and services:** Green banks have used various techniques and structures to attract and leverage private capital, including credit enhancements, warehousing and securitization, co-investment, and tools to enhance the ease and certainty of loan repayment, as well as technical assistance and other services to help develop markets.
- **Metrics:** Green banks have tracked financial and non-financial performance, including both direct impacts (e.g., leverage ratio) and indirect impacts to evaluate how their activities contribute to overall market transformation.

Even with all the impact that subnational green banks have had, there is a need for a national climate bank to fill gaps left by subnational banks, and crowd in private sector investment at the scale needed to rapidly facilitate

the low-carbon transition. Drawing from the experiences of subnational green banks, a new national climate bank should:

- operate as an independent nonprofit or, if that is not feasible, a quasi-public entity
- be capitalized with at least \$30 billion from Congress, with a directive to become a financially self-sustaining entity with a diversified funding stream within a few years
- have a clear, flexible, goal-oriented mandate to reduce greenhouse gas emissions, deploy clean energy technologies, and strengthen resilience to the impacts of climate change
- attract—and avoid crowding out or competing with—private investment
- provide technical and financial assistance to new and existing subnational green banks and financial institutions
- establish its own dedicated climate-focused portfolio, including supporting the development of larger-scale or regional infrastructure projects that subnational banks are not well positioned to address, supporting the commercialization and widespread deployment of less proven technologies, and providing investment at scale to assist fossil fuel-reliant communities in their transition to a net-zero economy
- have metrics of success to gauge impact, attract private funding, and inform when to exit from markets that are ripe to be handed off to the private sector

Together, subnational green banks and a national climate bank can leverage private investment at scale to support the comprehensive market response needed for widespread adoption of clean energy and other climate solutions.

INTRODUCTION

Decarbonizing the economy to avoid the worst impacts of climate change requires national-scale deployment of proven low- and zero-carbon technologies, as well as acceleration and deployment of emerging technologies. The rapid development, deployment, and scaling of these technologies—while also bolstering resilience to climate impacts—will require an urgent, and unprecedented infusion of capital. The scale of capital needed to facilitate the transition far exceeds public resources, yet private investors are often deterred by a variety of technological, market, and regulatory risks. Over the past decade, green banks have emerged as a critical financial mechanism to strategically deploy public resources in ways that can leverage private capital and accelerate the transition to a decarbonized, resilient future.

“Green banks” refer to state and local financial institutions—including government and non-profit entities—that leverage public funds and financing tools to attract capital for investments which most often include clean energy, energy efficiency, other distributed energy resources, and resilience projects.¹ More than 20 subnational green banks are currently in operation at the state, regional, county, and city levels in the United States. As of May 2021, government officials and local leaders are exploring green banks in 11 additional states.² Existing green banks have been established by different means (e.g., legislation, nonprofit incorporation), have taken on a variety of structures (e.g., public, quasi-public, nonprofit), and have been capitalized by a variety of funding types (e.g., public, private, philanthropic). The banks help fill knowledge and financing gaps in local markets, especially for smaller clean energy projects that traditional private lenders tend not to finance. Green banks partner with private lenders and other investors to mobilize capital,

reduce perceived project risks, and provide technical assistance.³ They often prioritize underserved markets where a lack of affordable capital and other barriers slow the adoption of clean energy technologies.⁴ Between 2011 and 2020, green banks invested approximately \$1.9 billion and leveraged \$5.1 billion in private capital investment, for a total of \$7 billion mobilized.⁵ Thus far, all subnational green banks have been established primarily as debt-financing institutions, wherein the capital invested is expected to be repaid, so they have mostly focused on the vital work of deploying established climate-related technologies, such as clean energy and energy efficiency.

A new national climate bank, capitalized by the federal government, could complement these efforts by providing technical and financial assistance to new and existing subnational green banks and financial institutions, while also establishing its own dedicated climate-focused portfolio addressing larger-scale projects that subnational banks are not well positioned to address. For example, a national climate bank could help support the widespread deployment of less proven, more capital-intensive technologies and infrastructure projects. Like state and local green banks, a national climate bank would focus on financing gaps and “crowding in” private finance to support the comprehensive market response needed for widespread adoption of clean energy and other climate solutions.⁶

This brief takes a closer look at the lessons learned from established subnational green banks and makes some recommendations for the future as they mature, and as new banks are established. The brief then draws on those experiences to offer recommendations for establishing a new national climate bank.

LESSONS LEARNED AND RECOMMENDATIONS FOR SUBNATIONAL GREEN BANKS

Surveying a decade's worth of state and local green bank successes and challenges can illuminate process and design elements that states and localities should consider as green banks mature and as new ones are established in order to accelerate clean energy deployment at local and regional levels. Key considerations include organizational structure, initial capitalization and ongoing funding, operational scope, types of financing products and services, and impact metrics.

OBJECTIVES & OPERATIONAL SCOPE

Green banks vary widely in the sectors they serve. Depending on the green bank, eligible projects could be in the residential, commercial, industrial, agricultural, nonprofit, municipal, or other sectors.

Notably, the majority of enabling charters for existing state and local green banks do not include explicit provisions to address climate change, resilience, or equity—areas currently receiving increased attention and stakeholder interest. Instead, most focus on specific types of projects, usually involving clean energy and energy efficiency. Some green banks serve very limited objectives. For example, the Climate Access Fund in Maryland was launched for the sole purpose of providing a third-party loan guarantee for the Maryland Energy Administration's community solar program, serving low- and middle-income communities.⁷ Other green banks are equipped to address a wide range of energy technologies and focal areas.

Some green banks have scopes that are far broader than energy. Several, such as the Rhode Island Infrastructure Bank, were initially formed as institutions to provide finance in areas such as clean water but have widened their project portfolios to incorporate clean energy and energy efficiency. This flexibility allows them to continue to serve the evolving needs of their communities. A green bank with a scope defined by broader objectives rather than by specific types of projects can be even more flexible and responsive to changing market and customer needs.⁸

STRUCTURE & ORGANIZATION

The structure of a green bank determines the bank's level of independence and the government's level of engagement in the bank's operation and direction.⁹

Regardless of structure, all state and local green banks in the United States are overseen by a board of directors or advisors. In general, green banks can assume one of three structures:

- **Public:** State or local governments can establish a green bank (through enabling legislation or executive action) as a public entity, housed within or acting as a state agency. The formation of a public green bank allows for the utilization of existing government resources, including staff, dollars, and operational structures, but public banks can also take a long time and significant political capital to form and can face volatility or limits on funding availability and operational flexibility.
- **Quasi-public:** Subnational governments can also establish a green bank as a quasi-public entity, where the bank has a somewhat independent existence but a specified number of members of the bank's board of directors are appointed by elected officials. This approach allows for the utilization of government input and resources but potentially retains more operational flexibility.
- **Nonprofit:** More recently, the incorporation of green banks as fully independent nonprofit organizations that do not require legislation or executive action has proven to be an effective model to overcome political and administrative barriers.¹⁰ In addition to an expedited path to incorporation, a nonprofit green bank has increased flexibility and autonomy—including the ability to select its own board members—but still receives some public support. For example, a government can remain involved through governance (e.g., board seats), financial contributions (e.g., budget allocations or grant awards), or marketing (e.g., press assistance and public endorsements). Partnerships between a nonprofit green bank and the state or local government can help establish mutual priorities and ensure programmatic alignment.¹¹ Compared to public and quasi-public green banks, though, nonprofit green banks have tended to be lean institutions, focused on loan origination, and close to local markets.¹²

Developers of new subnational green banks should select the governance structure that aligns with available public capacity and resources.

CAPITALIZATION & FUNDING

Green banks typically utilize funds provided by some combination of public, private, and philanthropic sources. Public funds are the most common source of initial capital for a new green bank—particularly, but not solely, for a public or quasi-public bank. For some banks, public funds may also provide a sustained stream of ongoing capitalization, drawing from regular budget funds, tax revenues, government grants and bonds, or utility bill surcharges. Other funds may be drawn from the revenues of carbon trading schemes, renewable electricity certificate (REC) sales, or legal settlements. Funds from private investors and financial institutions can supplement public start-up funding, particularly for nonprofit banks. Some state and local green banks have also diversified funding sources to include philanthropic and mission-driven capital, which can offer lower rates and longer terms than commercial capital, with value placed on non-financial outcomes.¹³

As green bank models and portfolios have evolved and expanded, they have also begun to secure funding from an even broader range of sources and at a scale beyond what is typically available at the state or local level. This evolution decreases the emphasis on competing for limited local public dollars and small foundation grants and, instead, shifts efforts towards building the capacity to access capital from anywhere in the country or world.¹⁴ For example, the Florida Solar and Energy Loan Fund (SELF), which serves low- and moderate-income underserved populations, not only is certified as a Community Development Financial Institution (CDFI), which allows access to federal Community Reinvestment Act bank loans, but also draws capital from faith-based organizations, impact investors, and globally crowdfunded loans in partnership with KIVA.org.¹⁵ To the extent feasible, subnational green banks should follow this trend of funding source diversification, which can enable greater market penetration of low-carbon technologies and emissions-reducing measures within the bank's jurisdiction.

Green banks are sometimes able to finance projects located outside of their jurisdiction, provided they generate benefits to residents or businesses within the jurisdiction. This approach could enhance a bank's ability to draw capital from regional partners and create efficiencies in financing regional and interstate projects. The New York Green Bank, for example, can invest in projects out of state in an amount proportional to the

benefits that will accrue to New York, which enables investor flexibility, including club deals, which pool investment from multiple lenders.¹⁶

Once operational, green banks mostly use financing to fund projects; the capital is expected to be repaid (with competitive and attractive interest) to fund future projects. This is known as capital recycling (e.g., revolving funds).

Human capital also plays an outsized role in the success of green banks. To attract and mobilize private capital effectively, green banks must have the personnel needed to generate customer awareness, develop partnerships (e.g., with lenders and service providers), communicate with lenders to address knowledge gaps and perceived risks, and create and administer loans and other products to customers.¹⁷ While some banks employ full-time staff members—at times staffed by employees from the government agencies in which they are housed—others utilize consultants.

INVESTMENT PRIORITIES: LOOKING AHEAD

To advance decarbonization in the years ahead, subnational green banks should continue investing in clean and renewable energy deployment and in energy efficiency, but there are additional focal areas that will require increased attention (that some green banks have already started to address). These include the following:

- **Accelerating clean energy uptake among low- and moderate-income households:** Increasing clean energy and energy efficiency adoption among low- and moderate-income (LMI) customers remains a ripe opportunity for many subnational green banks. Energy efficiency retrofits and clean energy installations can help lower the high energy burdens (defined as the percentage of income that a household pays towards energy costs) that many LMI households face, while energy savings cover some or all of the monthly loan payments. LMI communities often face barriers in securing traditional financing pathways due to real and perceived lender risk surrounding borrower equity, credit history, and other factors.

To mitigate these barriers, green banks can partner with local institutions—including utilities—to fill gaps and provide services and resources to better reach and de-risk projects in LMI communities. Green banks can also leverage available Opportunity Zone tax benefits to catalyze

BOX 1: Public Green Bank Model: New York Green Bank

New York Green Bank was launched in 2014 as one of the key pillars of the state's Reforming the Energy Vision (REV) strategy. Specifically, NY Green Bank was created as an initiative within the Clean Energy Fund, a 10-year, \$5.3 billion commitment by the state to advance clean energy market growth and innovation, through approaches that reduce ratepayer funding. Since it was established as a division of the New York State Energy Research and Development Authority (NYSERDA), rather than as a separate entity, NY Green Bank did not require legislation, though it did require an order by the New York Public Service Commission (PSC). NY Green Bank was initially capitalized with \$165.6 million issued by the PSC (including \$44.7 million from Regional Greenhouse Gas Initiative emissions allowances), plus \$150.0 million of reallocated NYSERDA funds. NY Green Bank also received capital from the Clean Energy Fund, which is funded through a utility ratepayer bill surcharge.¹

NY Green Bank works with private-sector partners to provide financing and overcome market barriers for clean energy and sustainable infrastructure projects. NY Green Bank's investment products include warehousing and aggregation, term loans and investments, credit enhancements, construction finance, and more.² The projects NY Green Bank invests in serve single and multifamily residential, commercial and industrial, agricultural, community-distributed generation, and utility-scale customers.³

From its inception through March 31, 2021, NY Green Bank has invested over \$1.3 billion, which has spurred close to \$3.6 billion of capital in clean energy projects across New York State. NY Green Bank's investments have driven between 16.4 and 29.3 million metric tons of greenhouse gas reductions. NY Green Bank is self-sufficient and has generated \$116.6 million in revenue through March 31, 2021, turning a profit for reinvestment into additional projects.⁴

NY Green Bank demonstrates how a robust, aligned ecosystem of policies and programs can enable green bank success. The scale of NY Green Bank's capitalization and the expansive scope of NYSERDA are somewhat unique, but they have allowed NY Green Bank to invest in financially and technically feasible projects with new business models and emerging technologies (e.g., storage, industrial electrification, hydrogen powered vehicles), which require specialized skillsets that may be beyond the ability of other state green banks and private investors. Still, a supportive policy environment may be an important indicator for where to set up new green banks or to provide additional support to existing banks.

projects in distressed LMI communities. The 2017 Tax Cuts and Jobs Act created more than 8,700 Qualified Opportunity Zones (QOZ) in low-income census tracts across all 50 states to incentivize private investment in a range of industries. Where investors can access QOZ tax benefits, green banks can further attract private capital to fund projects, since investors can access tax benefits by sponsoring clean energy, energy efficiency, and resilient infrastructure projects.

Subnational green banks have already begun to demonstrate their efficacy in marshalling

significant resources toward addressing financing gaps in LMI communities. For example, Michigan Saves supports LMI customers through a revolving loan and grant pilot program funded by DTE Energy (the local utility), and LMI lending has represented 56 percent of its overall residential portfolio.¹⁸ Maryland's Climate Access Fund functions similarly, by providing low-cost debt to finance community solar projects in Maryland's LMI areas, and it maintains a guarantee fund that will pay developers up to \$1 million in case of payment delay or nonpayment by a low-income

ratepayer.¹⁹ Florida SELF, the CDFI mentioned earlier, has directed 70 percent of its more than \$11 million in total lending toward LMI borrowers, with a default rate of less than 1.5 percent.²⁰ (Where excessive hurdles to creating a subnational green bank exist, a state or local government may choose to instead leverage existing CDFIs to deploy clean energy in underserved communities.)

- **Strengthening climate resilience:** As communities face increased frequency of severe weather, extreme temperatures, drought, flooding, sea level rise, and other climate impacts, climate resilience measures are needed to safeguard local economies and their constituencies. In response to the growing number and future projections of physical impacts of climate change, more governments are beginning to focus on climate resilience to prepare for, recover from, and adapt to these impacts.²¹ Despite the significant costs that municipalities face when unprepared to address climate impacts, municipal budgets for resilience are often insufficient, if available at all, and many of the costs of climate change (e.g., accelerated infrastructure repair and maintenance needs) are not covered by federal aid or insurance plans.²² It can be difficult to obtain private lending for resilience projects that enable preparedness for the consequences of climate change but whose quantifiable financial benefits are less predictable or less understood.

Green banks are beginning to try to fill the resilience financing gap. For example, Florida SELF partnered with MyStrongHome to develop a program to incorporate into the loan process the anticipated insurance premium savings from hardening roofs against hurricane damage.²³ The Rhode Island Infrastructure Bank is a leader in resilience lending, most recently through its Municipal Resilience Program (MRP), which engages municipalities to prepare for and implement the state resilience plan's recommended projects, such as dam repair and removal, road elevation, green stormwater infrastructure, backup power and energy efficiency, watershed restoration, urban tree planting, and coastal erosion control.²⁴ By participating in and completing the Community Resilience Building process, municipalities can receive certification that allows them to apply for MRP Action Grants to implement eligible resilience projects.²⁵ Similarly, the U.S. Department of Commerce's Economic Development Administration requires localities to include resilience considerations in their Comprehensive Economic Development Strategies (CEDS)²⁶ to be eligible to access grant funding from the agency. Where climate resilience is included within economic resilience considerations, state and local green banks could align with CEDS to integrate resilience measures into their lending requirements.

BOX 2: Financial Benefits of Resilience Investments

Communities that invest in resilience measures stand to benefit financially. A recent study found that every dollar spent on pre-disaster mitigation through federal mitigation grants saves \$6 in post-disaster recovery costs.* Another recent study on the costs and benefits of city-wide adoption of smart housing surfaces (e.g., a cool roof procurement policy for affordable housing) across Washington, D.C., Philadelphia, and El Paso found net present value (NPV) to be \$538 million for El Paso, \$1.8 billion for Washington, D.C., and \$3.6 billion for Philadelphia—and NPV was even higher if estimated avoided summer tourism losses were included.** Similarly, nature-based resilience measures can save communities billions in damage, repair, and maintenance costs. For example, the city of Philadelphia could save up to \$8 billion over 25 years through use of rain gardens, tree trenches, and green roofs to prevent stormwater runoff.***

* National Institute of Building Science: *Natural Hazard Mitigation Saves: 2019 Report*

** Glassbrook, Keith and Greg Kats. 2018. *Delivering Urban Resilience*. Washington, D.C.: U.S. Green Business Council. <https://www.usgbc.org/sites/default/files/delivering-urban-resilience-2018.pdf>

*** C2ES. *Nature-Based Solutions for Resilient, Equitable Cities*. Blog. January 28, 2021.

- Broadening the scope of infrastructure and technology lending:** Subnational green banks have, to date, typically focused on deploying widely accepted renewable electricity technologies and energy efficiency programs. These remain vital, but green banks can also play—and are starting to play—a role in deploying other needed infrastructure and technologies. For instance, green banks can help alleviate some of the financial, information, and coordination barriers to widespread alternative vehicle charging and refueling infrastructure.²⁷ Connecticut Green Bank, for example, was a founding member of the Electric Vehicle Charging Carbon Coalition, which enabled the generation of carbon offset credits for charging operators, the sales of which helped finance the construction of more charging stations and incentivized greater private investment.²⁸ Connecticut Green Bank also launched an initiative offering free electric vehicle charging stations to commercial property owners who use commercial Property Assessed Clean Energy (PACE) financing to implement building efficiency measures. PACE enables long-term funding for both up-front capital and soft costs of clean energy projects, by facilitating repayment through an assessment on the property’s regular tax bill.²⁹ Subnational green banks are well-positioned to promote energy storage infrastructure too. Among the first green banks to do so, NY Green Bank has set a target of at least \$200 million for storage-related investments.³⁰

Support for more nascent technologies, such as advanced nuclear and hydrogen, may be better suited to federal investment, as described later, but mature subnational banks and/or those with unique partnerships may be well positioned to support earlier stage, emerging technologies. Subnational green banks can also partner with other organizations to identify and cultivate promising technologies. For example, the Maryland Clean Energy Center has partnered with the Maryland Energy Innovation Accelerator, the Maryland Energy Innovation Institute, and Maryland-based universities and labs to facilitate early-stage technology commercialization.³¹
- Facilitating the transition for communities dependent on emitting industries:** In addition to helping advance equitable access to clean energy,

subnational green banks should focus on how to best utilize financing to assist fossil fuel-dependent communities and workers in their transition to a net-zero economy. A focus on diversification in low-, zero- and negative-emission industries and other low-carbon economic development opportunities is key to the long-term economic resilience of these communities. A better understanding is needed of how subnational green banks can support these communities with a mix of financing tools and economic development efforts.

TYPES OF FINANCING PRODUCTS & SERVICES

To attract and leverage private capital, green banks use various techniques and structures to overcome financing barriers associated with newer markets. These tools and strategies can reduce high upfront project costs and increase capital availability for customers across sectors to build a range of projects that otherwise could not be completed.³² Green banks typically provide products using a variety of financing techniques to fill gaps (generally in the \$5 million to \$50 million project range) that traditional private banks do not typically serve.

There are several financing techniques green banks can adopt to de-risk projects for private investors, such as:

- Credit enhancements:** Due to real and perceived risks associated with newer technologies or classes of customers, private investors may be hesitant to enter the market or only willing to lend at high interest rates. Credit enhancements are commonly used by green banks and increase the likelihood that a loan will be repaid.³³ Examples of enhancements include loan loss reserves (funds set aside to offset potential losses from unpaid loans) and loan guarantees (where green banks would assume the debt obligation of a borrower should the borrower default).³⁴ Such instruments help provide security to the lender and financial feasibility to the borrower.
- Warehousing and securitization:** Financing many small and decentralized projects (e.g., residential and small business energy efficiency) involves higher administrative and transactional costs (on a per-dollar-invested basis) than financing a few larger utility-scale projects. These inefficiencies of scale represent a significant barrier to private

BOX 3: Quasi-Public Green Bank Model: Connecticut Green Bank

Connecticut Green Bank was established in 2011 as the first state green bank in the United States. It was created by the legislature to achieve cleaner, cheaper, and more reliable sources of energy while creating jobs and supporting local economic development. Connecticut Green Bank, which evolved from the Connecticut Clean Energy Fund and the Clean Energy Finance and Investment Authority, is funded by the Clean Energy Fund (which itself is funded through a utility bill charge), along with proceeds from sales of emissions allowances through the Regional Greenhouse Gas Initiative, renewable energy certificate sales, interest income from loans, federal competitive solicitations and non-competitive resources, private foundations, and other sources.⁵ It is governed by a Board of Directors, with the Chair and several other members appointed by the Governor, senior leadership members of the Connecticut General Assembly, and leaders of relevant state agencies.⁶

Connecticut Green Bank offers programs for residential, commercial, multifamily, and municipal customers, as well as for residential and commercial contractors. It offers incentives, co-investment, credit support, warehousing, marketing, and other market-based tools to facilitate the state's clean energy transition. Connecticut Green Bank also administers the state's Commercial PACE (C-PACE) program for building energy improvements, provides low-interest residential loans for energy efficiency, and administers a solar rebate program.⁷

Since its inception through June 30, 2020, Connecticut Green Bank has mobilized over \$1.94 billion in private clean energy investment across the state with a Green Bank investment of \$294.2 million (a 6.6:1 leverage ratio). The bank has contributed to the generation of \$96.7 million in state tax revenues, supported the creation of more than 23,000 direct, indirect, and induced job-years, and reduced energy costs for more than 55,000 families and 375 businesses. Connecticut Green Bank has enabled more than 434 MW of installed clean energy capacity, helped reduce 8.9 million tons of carbon dioxide emissions, 8.4 million pounds of sulfur oxides, and 9.7 million pounds of nitrogen oxides, and created between \$232.7 and \$525.4 million of lifetime public health value in avoided sick days and hospital visits.⁸

As Connecticut Green Bank has matured, it has been able to expand its reach and bolster the capacity of other green banks. In 2018, Connecticut Green Bank spun off a new nonprofit called Inclusive Prosperity Capital to increase investment in underserved markets across the country, with a particular focus on low- and moderate-income communities. Inclusive Prosperity Capital is designed to access new mission-driven capital sources and forge partnerships with lenders, community-based organizations, and others. Thus far, Inclusive Prosperity Capital has partnered with Connecticut Green Bank and Michigan Saves to develop and launch the National Green Energy Network (NGEN), an online platform designed to streamline the loan application process and enable the scale-up of a standardized homeowner energy loan program in new regions. Inclusive Prosperity Capital has also worked to launch an ownership platform for distributed commercial and community solar projects.⁹

In 2017, as part of a series of budget cuts to fill a state budget deficit, the Connecticut General Assembly cut \$14.0 million annually for two years from the Connecticut Green Bank's budget in addition to diverting \$10.0 million and \$63.5 million annually for two years from RGGI auction proceeds and the CT Energy Efficiency Fund, respectively—a total of \$175.0 million in budget cuts across the three programs.¹⁰ Many green bank stakeholders have cited this to caution against close public or quasi-public affiliation and to encourage use of the independent nonprofit model. In fact, this event led to the spinoff of Inclusive Prosperity Capital, allowing Connecticut Green Bank to transfer some of its staff and programs while opening up new funding streams and bringing down costs by eliminating some overhead.¹¹

investment. Green banks can directly underwrite smaller projects spread out across different communities, bundle them together, and warehouse them until scale and diversity of risk are achieved. (Many green banks have begun to coordinate with each other, better positioning them to leverage standardized or shared products to make aggregation even easier.³⁵) Once bundled and warehoused, the loans can be sold to private investors through securitization or private placement, replacing public dollars with private capital.

- **Co-investment:** Green banks can co-invest in projects with private investors, enabling projects to move forward through senior debt (prioritized for repayment in case of bankruptcy carrying lowest risk), subordinated debt (repaid after senior debtors are repaid in full), or other mechanisms. Where needed, green banks can provide the gap financing sometimes required to close a deal, with varying levels of public-to-private leverage.

To enhance the ease and certainty of loan repayment, thereby further de-risking projects for private investors, green banks have also utilized structures such as on-bill repayment and PACE financing.³⁶ When customers face barriers to borrowing, on-bill repayment allows for a third-party to provide an energy upgrade loan, which customers repay directly on their utility bills as the energy and cost savings are realized over a period of time. (Utility bills typically have extremely high rates of payment.) Green banks, in collaboration with utilities, can leverage these on-bill repayment structures to facilitate projects and capitalize on existing customer relationships to reach underserved constituencies. Similarly, over 30 states have authorized commercial or residential PACE financing programs, under which a building owner repays an energy upgrade loan through property taxes via a new lien on the building.³⁷ Generally, these liens take first precedence for repayment in the event of a foreclosure, which makes them more attractive for private lenders, but have raised concerns among mortgage lenders given the increased risk associated with becoming the secondary lienholder. Several green banks have administered PACE programs, directly provided PACE loans, and offered credit enhancements to attract private lenders to the PACE market.³⁸ More green banks should consider serving as centralized PACE hubs that can administer programs, provide project financing

with the flexibility to take a subordinate lien position, if needed, and expand clean energy improvements in the commercial and residential sectors.

Complementing their financial products, green banks also offer services that help develop markets. For example, green banks provide technical assistance that can reduce knowledge barriers, grow private-sector confidence, and help facilitate financial transactions around relatively new technologies and markets. Green banks can also take on the role of developing standardized, scalable frameworks for underwriting processes and contract language that can reduce uncertainty and the costs of capital for projects. In addition, green banks can serve as a single point of contact for market information and government and utility resources—such as rebates, subsidies, loans, and technical assistance—enabling the banks to provide clear information on the value, process, and options for various types of projects.

Subnational green banks should continue to build partnerships both within and across state borders to scale successful products and services and to expand capacity at a regional level. The U.S. green bank community is convened and supported through network associations such as the Coalition for Green Capital's American Green Bank Consortium and Green Bank Network. As the number of green banks has grown over the past decade, they have been increasingly able to leverage each other's expertise and capacity.

TRACKING & REPORTING

Green banks have diverse rationales and goals, including driving emissions reductions, mobilizing private capital, lowering energy costs, developing green technology markets, supporting local economic development, improving public health, and creating jobs. Green banks track financial and non-financial performance to demonstrate both progress towards these goals to the public and profitability to private investors, and many green banks have established frameworks for impact assessment, monitoring, and reporting (see **Appendix A**).

Green banks primarily track their direct impacts, with most green banks reporting some combination of the following metrics at the portfolio level:³⁹

- cumulative green bank capital committed to projects since inception

- total value of projects supported
- leverage or mobilization ratio of public funds to total value of investments/projects
- number of transactions closed/projects completed
- carbon dioxide equivalent emissions avoided

Some green banks report other direct impacts too, such as the amount of installed clean energy capacity or production, total expected energy savings, job creation, dissemination of information to industry stakeholders,

total number of investment counterparties, impacts on biodiversity, waste diverted, and materials recycled.⁴⁰

Green banks may also track indirect impacts to evaluate how their activities contribute to overall market transformation (i.e., increased private-sector investment in decarbonization). Assessing whether a market transformation has occurred is a complex undertaking and can differ across markets, technologies, and business models. Since market changes occur over a longer time

BOX 4: Nonprofit Green Bank Model: Michigan Saves

Michigan Saves is the nation's first independent nonprofit green bank, established in 2009 through an \$8 million grant from the Michigan Public Service Commission (MPSC) that supported a two-year start-up period to establish the organization and an initial portfolio of programs. It became fully independent in 2011 and is governed by an 18-member board of directors with a special policy advisor appointed by the MPSC. Michigan Saves continues to receive grants from the state and the U.S. Department of Energy to expand and enhance its programs; its status as a nonprofit does not preclude the bank from receiving federal funding.¹²

Michigan Saves' purpose, as described in its Articles of Incorporation, is to finance energy efficiency, renewable energy, and related activities.¹³ This inclusive language has allowed the bank to maintain flexibility as circumstances and community needs have evolved. For example, in response to the coronavirus pandemic, Michigan Saves offered education and awareness opportunities for contractors to learn about federal programs available for small businesses and indoor air quality improvements were recently added to the bank's list of qualifying projects.¹⁴

Michigan Saves' portfolio includes programs for single and multifamily residential, commercial, and municipal customers, and it supports energy efficiency, geothermal, and solar PV projects. The organization leverages \$30 of private investment for every dollar of public investment by using a credit enhancement in the form of a loan loss reserve.¹⁵ The loan loss reserve allows private lenders including credit unions and banks to offer longer terms, better interest rates and more access to traditionally underrepresented markets. Michigan Saves also launched a revolving loan and rebate pilot program with its utility partner, DTE, for low- and moderate-income customers. Additional partnerships with DTE, Consumers Energy, and SEMCO Energy Gas Company, provide reduced interest rates to commercial and municipal customers for qualifying energy upgrades, including energy efficiency projects. As mentioned above, Michigan Saves also partnered with Connecticut Green Bank and Inclusive Prosperity Capital to develop and pilot NGEN.¹⁶

From 2010 through 2019, Michigan Saves supported more than \$229 million in clean energy projects for more than 23,000 homes and 1,500 commercial buildings.¹⁷ These projects resulted in 473,728 metric tons of greenhouse gas reductions and \$65 million in gas and electric utility bill savings. In 2020 alone, Michigan Saves supported \$53 million of residential and commercial clean energy investments.

Michigan Saves has received national recognition for its financial instruments and partnership models, and congressional leaders have designed a proposal for a national climate bank that draws from its success.¹⁸ The nonprofit model has insulated Michigan Saves from political volatility, while enabling operational flexibility in implementing its programs and partnering with different entities, while drawing on public resources as needed.

horizon, green banks need to establish a baseline against which to compare progress, accounting for multiple stakeholder actions and market and policy variables. To the extent possible, early in their development, green banks should consider which markets they will plan to assess several years into the future and commit to building impact metrics and establishing and collecting baseline data.⁴¹ A robust impact evaluation demonstrating both financial and social returns will provide assurance to both private investors and public funders for continued support and success. As markets are transformed and the private sector can lead deployment and financing efforts in specific clean energy

or climate-related areas, green banks (particularly those with a flexible operational scope) can scale down their role in those markets and shift their attention and resources to other markets where a need exists to lower market barriers and provide supportive capital.⁴² For example, Connecticut Green Bank developed a logic model for its CT Solar Loan program, and after three years, could demonstrably show the residential solar market evolving, with capital providers no longer needing the bank's support to finance projects; as such, the bank eased its investment, enabling the private sector to lead in financing new projects.⁴³

RECOMMENDATIONS FOR A NATIONAL CLIMATE BANK

Despite the successes that subnational green banks have within their jurisdictions, a national climate bank is necessary to fill gaps left by subnational banks, and crowd in private sector investment at the scale needed to rapidly facilitate the low-carbon transition across the United States. Congress seriously considered a national climate bank in 2009, with a proposal to create a Clean Energy Deployment Administration (CEDA) based on the green bank model. Since then, a number of national climate bank proposals have been introduced in Congress, including recently, and the idea of a national climate bank is now once again gaining increased attention as Administration officials and Congress examine the financing needed to decarbonize the economy. Drawing from the experiences of subnational green banks, the framework below is intended to illustrate how policymakers could balance the various objectives and interests associated with a national climate bank. It should be considered holistically, given that policy design elements are interrelated.

OBJECTIVE AND OPERATIONAL SCOPE

Unlike many subnational green banks, a national climate bank should be established with a clear mandate to reduce greenhouse gas emissions, deploy clean energy technologies, and strengthen resilience to the impacts of climate change. Such a mandate would provide the bank with the flexibility needed to continually focus on emerging needs, opportunities, and markets and to direct financing to the projects, technologies, or mechanisms that can best reduce climate impacts and/

or strengthen climate resilience in a given circumstance. The bank should set clear guiding priorities but continually conduct programmatic reviews to flexibly guide investments over a multi-decadal time horizon.

STRUCTURE & ORGANIZATION

A national climate bank should operate as an independent nonprofit. If operating as a nonprofit is not feasible, it should be established as a quasi-public entity. A nonprofit or quasi-public structure would enable a national climate bank to operate more nimbly as it could be established more quickly and with fewer long-term political vulnerabilities than a wholly federally operated national climate bank. If a nonprofit or quasi-public bank is established, it should be set up to allow for memoranda of understanding (MOUs) with federal agencies to leverage their technical expertise. If the bank must be set up as a federally operated national climate bank, it should reside in either the Department of the Treasury or the Department of Commerce, to ensure it would have access to complementary financial and technical expertise.

CAPITALIZATION & FUNDING

A national climate bank should be established with initial capitalization from Congress and direction to become a financially self-sustaining entity within a few years. Stakeholders have noted the need for the initial capitalization to be at least \$30 billion, ranging up to \$100 billion, with additional funding provided for a

set period. Analysis by the Coalition for Green Capital demonstrates that a national climate bank capitalized with \$35 billion could mobilize up to \$1 trillion of total investment over 30 years.⁴⁴ However, some estimates show that decarbonizing the electricity grid in the United States alone could require up to \$4.5 trillion of investment.⁴⁵ The financing gaps identified in this paper suggest a need for a national climate bank that can crowd in hundreds of billions, or even trillions, in necessary private capital.

INVESTMENT PRIORITIES

At a minimum, a national climate bank should provide support to subnational green banks and fill financing gaps for projects that may be too risky or too large for subnational banks (in terms of dollars or geography) but that are not traditionally financed by private lenders. More specifically, a national climate bank should prioritize the following:

- **Supporting subnational green banks & investment tools:** A national climate bank should provide technical and financial assistance to existing green banks, as well as initial capitalization to help establish new subnational green banks. While existing green banks have built local market expertise and established relationships with customers, contractors, and funders, a national climate bank can add dollars and capacity, help disseminate best practices, and grow the network of regional, state and local green banks across the United States.

Rather than financing state and local projects directly, a national climate bank should, wherever possible, support subnational green banks to ensure that local needs are being met and to grow local capacity and investment opportunities. A national climate bank could connect national funding streams—including both public- and private-sector lending—to state and local investment opportunities. The bank should also create guidelines and criteria, and should serve as a clearinghouse, for potential clean energy project partners. Such coordination also reduces the odds of national and subnational green banks devoting time and resources to the same project, enabling limited resources to be targeted more efficiently.

At present, subnational green banks are likely to be better suited to accelerate clean energy and

energy efficiency among LMI communities and to fill financing gaps related to local resilience. A national climate bank can support these efforts by providing financial and technical support to existing subnational green banks, helping to establish new subnational green banks, or partnering with local institutions (including CDFIs) to help close financing gaps in jurisdictions where establishing new subnational green banks is not feasible. With respect to widespread climate impacts, a national climate bank can strategically deploy financial and technical support and provide coordination of financing efforts to reduce a region's vulnerability.

- **Supporting the development of large-scale or regional infrastructure projects:** A national climate bank can play an important role in advancing critical infrastructure needed to enable and scale technologies that can decarbonize the economy, including grid modernization and alternative vehicle charging and refueling. While, as noted earlier, some subnational green banks can finance projects outside their jurisdiction that provide benefits to their jurisdiction, a national-level climate bank can finance projects across regions to a greater degree, including potentially coordinating or co-investing with subnational banks. The construction of a cleaner and more resilient grid is clearly such a project, as it will require investment in new high-voltage, long-distance, inter-regional transmission lines, including to bring clean energy from high resource to high demand areas; a national climate bank could help facilitate this transmission overhaul by coordinating public and private lending efforts and co-investing in projects.⁴⁶ Likewise, a national bank could support large, regional efforts to deploy alternative vehicle charging and refueling infrastructure, providing additional coordination, technical, and financial assistance to complement subnational green bank efforts.
- **Supporting the commercialization and widespread deployment of emerging technologies:** Technologies such as advanced nuclear, hydrogen, renewable natural gas, industrial electrification, and direct air capture are nascent but emerging opportunities deemed necessary to enable a transition to a net-zero future. At the moment, many are still being piloted through research,

development, demonstration, and deployment (RDD&D) efforts funded by both the private and public sectors. The size of the needed funding and the range of real and perceived financial, technical, and regulatory risks present challenges for most state and local green banks, which instead have been focused on filling financing gaps for proven, commercially available clean energy technologies. A national climate bank can accept risks and dollar amounts that subnational banks or the private sector cannot, making it ideally suited to provide support for the early commercialization projects needed to build market confidence in a new technology, referred to as first-of-a-kind (FOAK) through nth-of-a-kind (NOAK) projects. Many federal programs develop, pilot, and commercialize new technologies, and a national climate bank should work closely with those programs to avoid duplication and identify opportunities for synergies. Limitations in the technology or sectoral focus, as well as financing instruments available to these programs highlights the importance of collaboration with a national climate bank to fill critical, persistent financing gaps and/or help scale the reach of different programs. By establishing early-stage financing opportunities, leveraging public and private RDD&D efforts, and building strong relationships with other federal or nongovernmental innovation efforts, a national climate bank could serve as a conduit to finance the rapid deployment of nascent technologies as they become commercially viable. Subnational green banks can partner with the national climate bank and other organizations to support these kinds of deployments once the technologies and business models are more established.

- **Providing investment at scale to assist fossil fuel-reliant communities in their transition to a net-zero economy:** Like subnational green banks, a national climate bank should focus on how to best utilize financing to assist fossil fuel-dependent communities and workers in their transition to a net-zero economy. These investments could focus on projects that facilitate diversification into low-, zero- and negative-emission industries or other low-carbon economic opportunities that can enhance economic resilience. Facility buyouts could include payments to workers impacted by early

retirement of fossil assets. More research is needed to determine how a national climate bank can develop and deploy strategic financing mechanisms to assist such communities, particularly in states that lack subnational green banks, but also as a complement to subnational green bank efforts.

TYPES OF FINANCING PRODUCTS AND SERVICES

A national climate bank can leverage the same financing mechanisms that subnational banks currently use. As a national climate bank may be able to raise funds at a larger scale and borrow at a lower rate than subnational green banks or project developers, enabling it to provide access to lower-cost financing and to act more like a traditional development bank or mission-driven financial institution. (It would be motivated to maintain a high credit rating, though, to access the bond market, such as by keeping the balance sheet leverage ratio below or well below the leverage ratio of a traditional bank.) A national climate bank should also aim to diversify its funding streams. Providing transparency to private investors regarding how it seeks to attract, not compete with, private investment can serve that objective.

TRACKING & REPORTING

In addition to tracking and reporting its direct impacts, a national climate bank, like subnational green banks, should build impact metrics and baseline data collection into the start-up phase to be able to better demonstrate impact and market transformation over time. A robust impact evaluation demonstrating both financial and social returns will provide assurance to both private investors and the public for continued support and success. Tracking market transformation will also enable a national climate bank to know when it can scale down its role in particular markets and shift attention and resources to other markets with greater need.

Where a national climate bank receives federal funding for capitalizations and financial assistance, it should publicize its investments and outcomes with a public annual report to Congress to improve transparency and strengthen accountability. It should also articulate its plans and goals regarding how and where it seeks to deploy capital, in order to grow private-sector confidence and investment in targeted technologies, communities, and markets.

CONCLUSION

There are many lessons to be learned by examining existing subnational green banks in the United States, including their organizational structures, capitalizations and funding, operational scopes, types of financing products and services, and success metrics. As new state and local banks emerge, they can learn from these experiences and should craft models that best align with local circumstances and opportunities to use public funds to leverage much greater amounts of private and other capital for the net-zero transition. Subnational green banks have focused their efforts primarily on the vital need to expand deployment of established clean energy and energy efficiency technologies, but they are starting—and should continue—to expand their efforts to reach LMI communities, boost resilience to climate impacts, broaden the scope of their infrastructure and technology lending, and support communities reliant on emitting industries during the transition.

These experiences can also inform the establishment of a national climate bank, which is necessary to fill gaps left by subnational banks, and crowd in private sector investment at the scale needed to rapidly facilitate the low-carbon transition in the United States. A national bank should support subnational green banks in their efforts, but also pursue its own portfolio of initiatives to support the deployment of newly commercialized low- and zero-carbon technologies and large-scale infrastructure projects.

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APPENDIX A:

TABLE 1-A: Metrics Measured by Subnational Green Banks

GREEN BANK	METRICS MEASURED
California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA)	Metrics vary by program, and include: number of projects completed, environmental benefits (\$), fiscal benefits (\$), jobs created and retained, percentages of projects by sector, number of loans provided, average loan size, % of loans made to borrowers in LMI communities.
Climate Access Fund (CAF)	Planned: GHG emission reductions and equivalencies, number of households benefitted, accrued electricity bill savings. All metrics are solely applicable to LMI households.
Colorado Clean Energy Fund	Planned: GHG emissions reductions, jobs created, leverage value of private vs. public dollars, energy savings to end user.
Connecticut Green Bank	Connecticut Green Bank has a comprehensive Evaluation Framework to assess and monitor progress. Many metrics are measured, including: value of loans issued, number of loans issued, leverage ratio, capacity of renewable energy systems financed, demand reduction from renewable energy systems, energy savings, jobs created, greenhouse gas emissions reductions (metric tons CO ₂), public cost of energy. A select number of these are publicized in the Bank's annual reporting. The Bank has also developed methodologies to identify impacts in four specific areas: jobs, tax revenues, environmental protection, and public health improvement.
Energize Delaware	Annual report lists metrics by program. Metrics include: # home assessments completed, energy savings annual and lifetime (\$), gross energy savings annual and lifetime (MMBTU), emissions avoided (metric tons). Potential values also reported for energy savings and emissions avoided.
Florida Solar and Energy Loan Fund (SELF)	Emissions reductions (metric tons CO ₂), average energy bill savings (%), job hours created, number of homes retrofitted, number of people benefitted, default rate, total loans per year (\$), loan types (broken down by percentage of energy efficiency retrofits, wind hazard mitigation, solar PV, and solar water heaters), demographics of recipients (% women, veterans, over 60, LMI).
Hawaii Green Energy Market Securitization (GEMS) Program	Jobs created, jobs retained, Hawaii tax revenue generated, estimated kWh produced, estimated kWh reduced, estimated barrels of petroleum displaced, estimated metric tons of greenhouse gases avoided.
Inclusive Prosperity Capital	Annual/lifetime cost savings, renewable energy deployed (MWs), energy savings (MMBTUs), job years, low-to-moderate income impact, GHG emissions reductions, CO ₂ offset equivalencies, leveraged investment.
Maryland Clean Energy Center	Energy consumption reductions, renewable generation deployed, contract-equivalent job hours, leveraged investment, consumers impacted, new companies created.

GREEN BANK	METRICS MEASURED
Michigan Saves	Total projects, amount invested (\$), amount financed (\$), cumulative energy savings (kWh, therms), GHG emissions reductions (metric tons), utility bill savings and average cumulative savings per project (\$).
Montgomery County Green Bank	Energy savings, GHG emissions reductions, jobs created, leverage of capital, total project investment, LMI households served.
New York City Energy Efficiency Corporation	Emissions eliminated (metric tons CO ₂), energy saved (MMBtus), PM 2.5 reductions (pounds), percentage of projects in LMI communities, number of affordable housing units greened, number of buildings upgraded, capital mobilized (\$), number of lending partnerships, number of jobs created, breakdown of projects by technology type, breakdown of projects by building type.
New York Green Bank (NY Green Bank)	NY Green Bank has a comprehensive Metrics, Reporting & Evaluation Plan to assess and monitor progress. Many metrics are measured, including: cumulative committed funds (\$), cumulative deployed funds (\$), mobilization ratio, number and type of NY Green Bank investments (broken down by renewable energy and energy efficiency), installed energy saved by fuel type from energy efficiency projects (MWh/MMBtu), installed clean energy generated (MW), installed primary energy saved from CHP (Btu), installed clean energy generation installed capacity (MW), installed GHG emissions reductions (metric tons). NY Green Bank reports both lifetime and annual totals for the emissions, energy savings and generation metrics tracked.
Rhode Island Infrastructure Bank	Jobs created; jobs supported; financing provided, both cumulative and broken down by loan program (\$); number of loans closed.

Other Climate Innovation 2050 Resources:

Getting to Zero: A U.S. Climate Agenda

<https://www.c2es.org/document/getting-to-zero-a-u-s-climate-agenda/>

Pathways to 2050: Scenarios for Decarbonizing the U.S. Economy

<https://www.c2es.org/document/pathways-to-2050-scenarios-for-decarbonizing-the-u-s-economy/>

Restoring the Economy with Climate Solutions: Recommendations to Congress

<https://www.c2es.org/document/restoring-the-economy-with-climate-solutions-recommendations-to-congress/>

Climate Policy Priorities for the New Administration and Congress

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