

Seeding CAPITAL

Policy Solutions to Accelerate Investment
in Nature-Based Climate Action

JUNE 2021
Policy Report

Climate Change
and Business
Research Initiative





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Climate Action

ABOUT THIS REPORT

This policy report is part of a series on how specific sectors of the business community can drive key climate change solutions and how policymakers can facilitate those solutions. Each report results from workshop convenings that include expert representatives from the business, academic, policy, and environmental sectors. The convenings and resulting policy reports are sponsored by Bank of America and produced by a partnership of UC Berkeley School of Law's Center for Law, Energy & the Environment (CLEE) and UCLA School of Law's Emmett Institute on Climate Change and the Environment. The UC organizers select topics and participants based on outreach to both public- and private-sector experts for a small-group, facilitated discussion format.

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ABOUT THE CENTER FOR LAW, ENERGY & THE ENVIRONMENT

The Center for Law, Energy & the Environment (CLEE) channels the expertise and creativity of the Berkeley Law community into pragmatic policy solutions to environmental and energy challenges. CLEE works with government, business, and the nonprofit sector to help solve urgent problems requiring innovative, often interdisciplinary approaches. Drawing on the combined expertise of faculty, staff and students across University of California, Berkeley, CLEE strives to translate empirical findings into smart public policy solutions to better environmental and energy governance systems.

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The Emmett Institute on Climate Change and the Environment is among the leading environmental law programs in the country, with faculty members renowned for their public service, teaching excellence, and scholarship in state, federal, and international law. Located in Los Angeles, a diverse city facing unique environmental justice and climate change challenges, the Emmett Institute provides J.D. and LL.M. students unmatched opportunities for mentoring, career placement, and experiential learning. Through groundbreaking research and public interest initiatives, the Emmett Institute helps shape climate change and environmental law and policy in California, the United States, and jurisdictions around the world.

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I. INTRODUCTION & EXECUTIVE SUMMARY

Nature-based climate solutions harness ecosystems' natural abilities to sequester carbon in plants and soils, thus reducing the concentration of atmospheric greenhouse gases. They include practices and uses such as managing forests to reduce wildfire risk and store carbon, restoring degraded rivers and wetlands, and creating green space in cities. Governments, property owners, and other stakeholders can make substantial progress towards global climate change targets by using natural ecosystems and working lands (such as farmlands) as valuable carbon sinks. However, achieving this progress will require a significant increase in public and private investment.

Nature-based climate solutions—including land-use measures, improvement of natural carbon sinks, and agricultural sector emissions reductions—could mitigate between 2 and 36.8 gigatons of carbon dioxide equivalent per year (GtCO₂e/yr), potentially contributing more than one-third of the cost-effective carbon dioxide mitigation required during this decade for the world to have a strong chance of preventing warming beyond two degrees Celsius.¹ As a result, this report defines nature-based negative emissions efforts as complements to—rather than replacements for—traditional emissions mitigation efforts.

In addition to their role in managing global carbon emissions, nature-based climate solutions provide significant climate adaptation and resilience benefits, from supporting improved water quality to mitigating severe wildfire risk. They also offer social and economic co-benefits for local communities, including healthier agricultural soils, enhanced access to recreational opportunities, richer biodiversity, and potential job creation.² For example, innovative forest management techniques can allow greater carbon uptake while also bolstering the market for timber products and driving local economic benefits without detriment to the forest ecosystem.

When managed in the context of land-sector emissions, nature-based solutions can enhance California's broader climate change strategy and can generate significant net emission reductions and bolster (rather than replace) other emission reduction efforts. Not only can California and other jurisdictions achieve wide-ranging climate, resilience, and economic benefits from nature-based solutions, but the state also can target nature-based solutions to specific

sources of difficult-to-reduce emissions, such as those from the agricultural sector.

To implement the full potential of nature-based solutions, climate advocates and other stakeholders will need to deploy more capital to encourage decision-makers, property owners, and investors to support proper management and conservation. Communities and project developers will need greater access to capital if nature-based projects are to become a staple of California's climate solutions. However, project developers often struggle to find investors. In traditional incentive structures, market actors value exploitation of natural resources more than sustainable management or conservation, resulting in environmental degradation (including climate change) and limiting investment in nature-based solutions.³ But by encouraging responsible use, valuing natural systems for the benefits they provide, and considering non-market values, California leaders can capture more carbon and generate environmental and economic benefits in the process.

DEFINING “INVESTMENT” IN NATURE-BASED CLIMATE SOLUTIONS

This report uses the term “investment” to broadly encompass two distinct but related means of paying for nature-based climate projects: *funding*, which involves direct expenditure of money with no repayment obligation (such as through grants or government allocation of tax revenues); and *financing*, which involves the borrowing and lending of money with a repayment obligation (such as through a traditional bank loan or a revolving fund), often with interest due and sometimes secured by an interest in property.⁴

To identify challenges to and top-priority solutions for investing in nature-based projects, UC Berkeley School of Law's Center for Law, Energy and the Environment (CLEE) and UCLA School of Law's Emmett Institute on Climate Change and the Environment convened climate and environmental regulators, nature-based and public finance experts, and ecosystem conservation leaders in December 2020 with participants selected based on consultation with public- and private-sector leaders for a small-group convening. This policy brief is informed by these expert stakeholders' vision for supporting investment in nature-based climate solutions in California, the key barriers limiting progress toward that vision, and actionable solutions to overcome those barriers.

The top barriers and solutions include:

BARRIER #1: FAILURE OF MARKETS TO RECOGNIZE THE BENEFITS OF NATURE-BASED CARBON SEQUESTRATION DISINCENTIVIZES INVESTMENT

Solutions:

- Federal and state leaders could ensure that nature-based carbon sequestration projects in critical watersheds account for and utilize the value of resulting water savings.

- California state agencies, such as the Treasurer’s Office and Department of Finance, could align nature-based investment products with international standards and labels to drive investor interest.
- State and local leaders could leverage California Environmental Quality Act (CEQA) mitigation to fund projects on natural and working lands, such as mitigation for significant greenhouse gas emissions or transportation impacts under Senate Bill 743.
- Federal and state leaders could make more lands eligible for carbon cap-and-trade offset protocols.
- Local governments and insurers could develop innovative insurance models to bring private investment and community approaches to nature-based resilience and climate solutions.

BARRIER #2: LACK OF ADEQUATE DATA AND METRICS INHIBITS DECISION-MAKING BY INVESTORS

Solutions:

- State leaders, such as the California Natural Resources Agency, could incorporate and develop financial data on all benefits of nature-based action to inform public funding decisions.
- The California Air Resources Board, in collaboration with the California Natural Resources Agency, California Environmental Protection Agency, Governor’s Office of Planning and Research, and external institutions, could standardize and refine carbon accounting methods and greenhouse gas protocol frameworks across land uses, sectors, and asset classes to incorporate quantification of natural and working lands emissions and sequestration.
- State agencies (such as the California Natural Resources Agency or Governor’s Office of Planning and Research), with legislative support, could develop and standardize environmental and community impact accounting practices to inform investment choices
- The legislature could require the integration of climate impacts into infrastructure planning and the development of green infrastructure standards.
- The California Environmental Protection Agency, Natural Resources Agency, and Office of Planning and Research could ensure the adoption of statewide green infrastructure design standards that integrate nature-based solutions into state agencies’ existing decision-making framework.
- The legislature could dedicate funding to demonstration projects aimed at improving measurement and quantification practices.

BARRIER #3: MISALIGNMENT BETWEEN PROJECT STRUCTURES, PUBLIC PROCESSES, AND INVESTMENT NEEDS SLOWS THE DEVELOPMENT OF VIABLE FINANCIAL FRAMEWORKS

Solutions:

- Project developers and local governments could bundle and/or diversify nature-based climate actions to achieve investment scale and reduce risk.
- State legislators and the California Department of Insurance could develop mechanisms to increase the insurability of forest and watershed assets.
- State legislators and public pension leaders could promote investment in nature-based climate action that aligns with long-term funding goals.
- Resource managers could conduct advance planning and permitting for multiple potential projects to create “portfolios” for grantors and investors to finance.



II. OVERVIEW: THE POTENTIAL AND NEED FOR INVESTMENT IN NATURE-BASED CLIMATE SOLUTIONS

A. CALIFORNIA'S CLIMATE, ENVIRONMENTAL, SOCIAL, AND ECONOMIC GOALS CALL FOR INVESTMENT IN NATURE-BASED SOLUTIONS

California must reduce greenhouse gas (GHG) emissions 40 percent below 1990 levels by 2030 and achieve carbon neutrality no later than 2045, as established by Senate Bill 32 and Executive Order B-55-18, respectively.⁵ A system-level shift of this magnitude depends on a diverse suite of emission reduction actions, policies, and sector- and region-specific responses. Nature-based climate solutions, which rely on the emission-trapping power of natural ecosystems, can be deployed alongside other climate change mitigation solutions, such as decarbonizing the energy grid and shifting to zero-carbon transportation. When applied appropriately, these solutions can bolster rather than replace other emission reduction efforts, reducing emissions from otherwise difficult-to-mitigate activities that have few technologically feasible or economically practical alternative reduction pathways, including in the agricultural sector. Nature-based solutions can offer additional—rather than replacement—opportunities to limit warming as recommended by the Intergovernmental Panel on Climate Change (IPCC) and other leading climate agencies. Nature-based solutions can also offer climate adaptation and non-climate environmental benefits, such as preventing erosion, improving water supplies, and supporting vital ecosystems.

Governor Newsom's October 2020 Executive Order to conserve 30 percent of the state's lands and coastal waters by 2030 could help focus attention and funding for nature-based efforts over the coming decade.⁶ Much of California's land area consists of natural and working lands, including forests, coastal lands, wetlands, grasslands, agricultural lands, river areas, woodlands, rangelands, shrublands, and green space in urban areas.⁷ Natural and working lands provide essential resources, such as water and food, and carry intrinsic value, but these lands face degradation. Damage to and loss of natural and working lands has negative implications for ecosystems and the communities that depend on them, as well as the state's carbon emissions. For example, California's agricultural lands are essential to local and national food production, but their productivity is increasingly threatened by climate change—highlighting the need for management that aligns reducing agricultural greenhouse gas emissions, currently responsible for about eight percent of California's total emissions, with climate adaptation and supply resilience.⁸ According to the California

Air Resources Board, natural and working land disturbances since 2001 have broadly reduced carbon stocks in soils and forested lands; at the same time, many experts identify under-managed forests as a factor in increased wildfire risk, highlighting the need for high-quality management projects to maximize climate, health, and ecosystem benefits.⁹ California’s 2030 Natural and Working Lands Climate Change Implementation Plan seeks to reverse this damage and increase carbon uptake (as well as ecosystem resilience) on a range of land types through several approaches, including improved forest management, modified agricultural practices, and restoration and conservation.¹⁰

The International Union for the Conservation of Nature (IUCN) has defined nature-based solutions as “actions to protect, sustainably manage, and restore natural or modified ecosystems, which address societal challenges (e.g., climate change, food and water security or natural disasters) effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.”¹¹ This report focuses primarily on nature-based solutions that involve a direct climate change mitigation or adaptation/resilience benefit and often include other ecosystem services benefits, and it specifically addresses methods to secure investment to advance these solutions.

Nature-based solutions span a wide range of applications, ecosystems, physical locations, and timescales. Examples include, but certainly are not limited to, restoring degraded land and ocean ecosystems, such as wetlands, grasslands, rivers, forests, coastal habitats, and agricultural land; managing soils to boost productivity, increase carbon storage, and reduce erosion; utilizing and creating green space in cities and building green infrastructure; and managing forests to reduce wildfire risk while capturing carbon and creating economic opportunities, including through agroforestry.¹² Although some definitions of green infrastructure focus on water management benefits, this report primarily considers green infrastructure that can store carbon while also offering water management benefits, such as green spaces incorporated into urban areas or the built environment—examples include parks, green roofs, or rain gardens.¹³

Policy makers should consider nature-based solutions in the context of other environmental- and climate-related priorities. For example, emerging research suggests that wetlands could be significant emitters of methane, a greenhouse gas with a greater warming potential than carbon dioxide.¹⁴ Project developers and state leaders can thus track emerging science on wetland methane emissions and other potential unintentional negative consequences of nature-based solutions as part of a holistic approach to ensure that projects focus on low-emitting aquatic environments and avoid emissions-increasing human disturbances.

B. NATURE-BASED SOLUTIONS ARE COST-EFFECTIVE CLIMATE INVESTMENTS

Nature-based solutions (including traditional ecosystem management practices and more recent innovations) can be a relatively low-cost approach to removing existing carbon dioxide from the atmosphere, compared to engineered carbon removal approaches (e.g., direct air capture); however, both natural and engineered

negative emissions solutions likely will be necessary to reach statewide and global carbon neutrality and climate change goals even in conjunction with aggressive mitigation efforts.¹⁵ A Lawrence Livermore National Laboratory (LLNL) report estimated that nature-based solutions cost an average of \$11 per ton of carbon dioxide removed from the atmosphere, which is less expensive than the other negative emissions solutions examined in the report. For example, the near-term estimated cost of direct air carbon capture technology deployment is between \$230 and \$266 per ton of carbon dioxide removed, depending on the specific technology applied.¹⁶ The study further estimated that California could remove 25.5 million tons of carbon dioxide equivalent (CO₂e) from the atmosphere per year through solutions on natural and working lands, with forest management changes offering the most significant negative emissions potential and the lowest average cost.¹⁷

While engineered solutions may ultimately be necessary for California to reach its carbon neutrality goals, nature-based solutions provide a more immediately cost-effective and resilient way to scale up negative emissions pathways over a shorter timeframe. These pathways will have to encompass projects that both sequester atmospheric carbon and limit emissions from natural lands.

In addition to their climate change mitigation benefits, nature-based solutions offer a multitude of potential climate adaptation and resilience benefits, from preventing flood damage to cooling urban heat islands.¹⁸ Nature-based solutions can strengthen communities' ability to adapt to the current and future impacts of our changing climate and can be an essential tool in California's climate adaptation toolkit, allowing Californians to manage hotter temperatures, changes in precipitation, stronger storms, and more frequent and intense wildfires.

Nature-based solutions also offer crucial non-climate environmental, social, and economic benefits that can improve all Californians' well-being. For example, restored and conserved wetlands filter a substantial quantity of metals, industrial pollutants, and other hazardous materials from water, improving local water quality.¹⁹ Additionally, research suggests that access to natural spaces improves public health by reducing stress, decreasing obesity factors, and reducing local air pollution.²⁰ Nature-based solutions can increase access to recreational opportunities, from boating to hiking.²¹ The connection between open outdoor spaces and public health has never been more apparent than during the COVID-19 pandemic, given the need for most people to exercise, meet safely, and enjoy the outdoors after spending more time at home. Ecosystem preservation and enhancement also promote biodiversity. Finally, nature-based solutions can generate economic activity and job creation. Responsibly managed forests, fisheries, and agricultural lands can support existing and new employment over the long term, and restoration projects can create new jobs in the near term, potentially helping address COVID-19 recovery efforts.²² California can improve equitable access to these benefits by collaborating with underserved communities to select and site nature-based projects as appropriate.

Many of the December 2020 convening participants focused on California's forests as a high priority for adopting nature-based solutions, while others emphasized solutions applicable across multiple ecosystems rather than prioritizing one type of landscape. The attention on forests partially reflected

the impact of California's recent devastating wildfires on climate conversations in the state. The convening discussion served as an important reminder that nature-based solutions can help manage immediate and urgent threats—such as the buildup of forest biomass combined with hotter, drier conditions—alongside other perhaps less-visible priorities like sequestering carbon over long-timeframes in our natural systems. Some participants noted that simply maximizing carbon sequestration potential in forests, for example, would run counter to wildfire reduction goals.

Nature-based climate solutions vary widely in their cost-effectiveness. A straightforward approach to evaluating projects' cost-effectiveness is to consider their average cost (in dollars per tons of CO₂e removed per year) relative to the total amount of negative emissions each project could achieve. For example, the LLNL report mentioned above calculates that changes to forest management have among the highest negative emissions potential overall, at 15.5 million tons of CO₂e removed per year by 2045 with a relatively low cost of \$0.8 per ton CO₂e. Soil-based projects offer a middle-range comparison, with 3.9 million tons of negative emissions potential per year in 2045 at an average cost of \$15 per ton CO₂e.²³ The most expensive natural solution evaluated in the LLNL report was freshwater wetland restoration, which had a negative emissions potential of 0.2 million tons CO₂e/year in 2045 at an average cost of \$440.5 per ton CO₂e.²⁴

Ultimately, any application of nature-based solutions should strive to bridge immediate needs with long-term planning while taking a whole-ecosystem and community-driven approach to decision making. Proponents will also need to consider non-monetary factors and assess non-carbon benefits of the project; nevertheless, comparing benefits and costs—even estimates—will be vital to the decision-making process.

C. MORE PUBLIC AND PRIVATE CAPITAL IS NEEDED TO MEET EMISSION REDUCTION AND RESILIENCE TARGETS

The amenability of nature-based projects to greater investment will depend on a combination of factors, including the expected impacts of the project, the anticipated public and private stakeholder benefits, the ability to generate defined returns for investors, and the regions and ecosystems affected. While investment in natural ecosystems and conservation has risen in recent years, project developers will need a significant increase in capital to meet state goals for greenhouse gas emission reduction and resilience against climate risks. One 2020 analysis identified a global biodiversity financing gap of approximately \$600-800 billion annually and estimated that worldwide investment in nature-based climate solutions and carbon markets will rise to \$25-40 billion per year by 2030 to meet this need (up from approximately \$1 billion per year at present).²⁵

These investments will function as a subset of the broader climate finance market, which exceeds \$500 billion per year and may grow rapidly through COVID-19 economic recovery programs. Yet the capital deployed to date still falls far below the \$4 trillion per year potentially needed to meet emissions

and adaptation targets.²⁶ These investments also will be part of the broader natural capital finance market—incorporating climate mitigation and resilience investments as well as other ecosystem and habitat investments—which is rapidly developing but has proven difficult to measure.²⁷ Governments can provide some of this capital through direct investment, subsidized loans, and policy support (e.g., carbon pricing), but they will need a significant increase in private capital to fill the gap.²⁸

D. FINANCIAL INNOVATIONS ARE RAPIDLY EVOLVING BUT NEED POLICY SUPPORT

Public and private entities are developing a set of innovative financial instruments and entities, and repurposing existing structures, to meet the investment gap. Participants identified a wide range of instruments and entities including:

Government spending, programs, and fees that can provide public dollars and shape private incentives to support nature-based action, including:

- **Direct public investment and spending programs** like California Climate Investments (CCI, funded through the cap-and-trade generated Greenhouse Gas Reduction Fund), in particular in projects with high resilience or economic development potential, such as transportation and processing infrastructure for small forest biomass.²⁹
- **State and local competitive grant programs**, such as the now-expired \$18.5 million Green Infrastructure Grant Program administered by the California Natural Resources Agency and authorized by Proposition 68 (2018).
- **State revolving funds**, such as the California Drinking Water State Revolving Fund, which can assist local governments with construction and maintenance of infrastructure (natural and built) that preserves environmental quality.
- **Low-interest loans and credit support** through state financing entities such as the California Infrastructure and Economic Development Bank (IBank).
- **Tax policy**, which has successfully driven rapid expansion of investment in renewable energy via the federal investment tax credit for solar projects and production tax credit for wind projects,³⁰ and includes incentives like the federal Opportunity Zone program, which provides capital gains tax benefits in exchange for investment in qualifying lower-income areas;³¹ and can also be deployed both to disincentivize high-emitting activities and raise revenue for climate investments.
- **Impact fees and mitigation banks**, which can assess fees based on the environmental impact of new development and redirect the funds to environmental mitigation projects, including climate mitigation and adaptation efforts, with the potential to pool and aggregate funds into high-priority projects.³²
- **Public benefit charges** like those imposed by the California Public Utilities Commission to fund a range of state grant and investment programs, such as the energy research and development-oriented Electric Program Investment Charge.³³
- **Public pension funds**, which can manage hundreds of billions of dollars of assets on behalf of state employees, creating incentives to direct investments toward projects that advance climate resilience and sustainability within the state.

Bond financing, including both general obligation bonds long employed by state and local policymakers to finance infrastructure investment, and a subset of sustainable investment-focused instruments such as:

- **Green bonds**, which direct proceeds to environmentally beneficial projects and typically meet international certification standards for project selection and evaluation, management of funds, and reporting of benefits.³⁴
- **Environmental impact bonds**, a subset of green bonds featuring a “pay for success” model that varies financial outcomes based on project performance.³⁵
- **Forest resilience bonds**, green bonds that specifically target multi-benefit sustainable forest restoration projects through a coalition of investor-beneficiaries.³⁶
- **Catastrophe bonds**, which raise proceeds for eventual use in natural disaster response and recovery, often overlapping with resilience investment.³⁷
- **Resilience bonds**, a variant of catastrophe bond that can generate “resilience rebates” to fund risk mitigation efforts.³⁸

Market-based instruments and structures that directly channel private capital to public benefits or expand the information available for investment decision-making, such as:

- **Carbon pricing**, such as California’s greenhouse gas cap-and-trade program, which can support investment in nature-based climate solutions by increasing the cost of competing fossil fuel investments, generating capital for direct investment via state greenhouse gas reduction funds (such as CCI), and creating markets for carbon offsets that can provide revenue for qualifying mitigation projects.³⁹
- **Payment for ecosystem services**, which involves direct compensation for preservation of valuable ecosystems such as watersheds and carbon sinks and could potentially expand into urban environments.⁴⁰
- **Institutional investors** with net-zero investment targets, which have internal incentives to identify (and compete for) investment opportunities that advance state climate goals.
- **Concessionary capital** from mission-focused foundations and non-profits, which can support early-stage and lower-yield projects outright or through blended finance structures that incorporate concessionary and market-rate investment.
- **Climate risk disclosure policies**, which can increase investor knowledge of climate-related risk in the economy as well as the attractiveness of sustainable investment opportunities including nature-based climate solutions.⁴¹

Insurance, which governments and businesses are using not only to protect against the financial impacts of climate events but also to incentivize proactive investment in climate resilience and risk-mitigating natural infrastructure, including through mechanisms like risk pooling and premium discounts.⁴²

While these and other instruments hold great potential to accelerate investment in nature-based climate solutions, several barriers may be slowing uptake worldwide and in California. Barriers include a lack of widespread knowledge on the availability and revenue/benefit generation potential of these investment opportunities; competing priorities for public investment, including long-overdue maintenance and upgrades of built infrastructure; California state constitutional provisions requiring supermajority votes for most new tax and fee measures;⁴³ a lack of robust markets for certain forest products; and a lack of comprehensive pricing schemes for natural emissions. California policymakers will need to respond with a set of supportive policies and resources to help overcome these barriers.

III. VISION FOR INVESTMENT IN NATURE-BASED CLIMATE SOLUTIONS IN CALIFORNIA

Participants at the December 2020 convening described a vision for investment in nature-based climate solutions in California that:

- Plays a critical role in **achieving California’s 2045 carbon neutrality goal** by reducing new emissions, removing past emissions from the atmosphere, and limiting emissions from natural and working lands, in conjunction with ongoing efforts to mitigate anthropogenic emissions
- Aligns the scope and investment timing with both the **urgency of climate change** and **principles of ecosystem management**
- Addresses the urgent need to **reduce fire risk, mitigate wildfire damage, and reduce carbon emitted through forest burning**, in part through developing market uses for forest wood products and by providing buffers between developed and high-fire areas
- Incorporates a **price for ecosystem services into market transactions** and monetizes co-benefits, such as the prevention of coastal erosion from restored wetlands and avoidance of land conversion to uses that increase driving
- Allocates **financial responsibility** proportionally based on the source of harm
- Acknowledges that nature-based solutions **may increase in value over time**
- Incorporates **environmental justice** and provides **community benefits** for both urban and rural areas, including sustainable job production in natural and working lands communities
- Brings nature into the policy and financing equation on **decisions regarding finance, jobs, and economics**, among others, while breaking down siloes among stakeholders in finance, permitting, and industry



IV. BARRIERS AND PRIORITY POLICY SOLUTIONS

Convening participants identified a range of barriers to achieving this vision for financing nature-based climate solutions. This section describes those barriers in detail and highlights the top-priority policy solutions participants identified to overcome them.

BARRIER 1: FAILURE OF MARKETS TO RECOGNIZE THE BENEFITS OF NATURE-BASED CARBON SEQUESTRATION DISINCENTIVIZES INVESTMENT

Participants noted that nature-based climate action currently suffers from inadequate or misplaced market recognition of climate mitigation and adaptation and of other ecosystem services, which results in failure to capture environmental externalities and benefits. The lack of a carbon price or similar market-pricing signals for emissions from natural and working lands hurts the prospects for financing nature-based actions. Furthermore, past structures of municipal and corporate debt typically do not account for climate risks and therefore fail to value properly the climate benefits that nature-based actions can provide. These failures to capture or even measure externalities also include the lack of accounting for the potential benefits from reduced severity of wildfires, such as saved homes and structures and avoided emissions (which could be furthered if the building sector were encouraged to use low-carbon, less flammable material); along with greater resilience in the face of drought, sea level rise, and extreme weather. Finally, financial and policy markets currently do not offer adequate payments for ecosystem services based on a regulated, standardized system, making the value of many nature-based investments difficult to communicate to potential investors. Solutions will need to focus on improving the measurement of benefit value and bolstering public sector markets to help finance nature-based solutions.

Solution: Federal and state leaders could ensure that nature-based carbon sequestration projects in critical watersheds account for and utilize the value of resulting water savings.

Water resources in various ecosystems, particularly forests, hold value comparable to timber, other forest products, or carbon savings, but this value is often left out of project planning and investment decisions.⁴⁴ To capture this value, state leaders could promote the incorporation of water quality benefits as a means to attract more capital to forest management carbon sequestration projects. For example, a forest resilience bond could raise capital for projects that advance watershed conservation in forests. Investors interested in water- or forest-related climate change initiatives would have a tangible opportunity to support a project, at relatively low upfront cost and risk to the investor, while helping the project become a reality and receiving payment potentially from water utilities and carbon offset sources. Federal and state leaders could also help facilitate water payors and users coordinating with other funders, such as state conservancies and agencies like CAL FIRE, to fund these projects.

Solution: California state agencies, such as the Treasurer's Office and Department of Finance, could align nature-based investment products with international standards and labels to drive investor interest.

In addition to selecting projects that will generate returns, investors interested in funding climate action often seek third-party labels that indicate the investment is consistent with internationally recognized pathways for decarbonization, such as the United Nations' Sustainable Development Goals (SDG) or Climate Resilience Principles from the Climate Bond Initiative.⁴⁵ The European Union and states like New York have made progress matching their in-state project lists with these international standards to facilitate investment. California policy makers could similarly encourage state agencies and other entities with nature-based climate action projects to ensure alignment with increasingly accepted definitions of eligible project types and therefore help attract more long-term investment. Aligning projects with existing definitions not only adds consistency and credibility through third-party verification, but also improves investors' ability to compare across nature-based and non-nature-based options, including more tangible, traditional infrastructure projects. Examples of such action include state agencies like the Treasurer's Office and Department of Finance updating definitions of sustainability and green bonds to align with international standards, as well as ensuring that state buildings are aligned with green building definitions to facilitate investment. In some cases, legislation may be required to alter statutory funding programs. Given the size of the California economy, the state is well positioned to influence market actors and other states through these regulations and guidance on which labels are most useful and valid.

Solution: State and local leaders could leverage California Environmental Quality Act (CEQA) mitigation to fund projects on natural and working lands, such as mitigation for significant greenhouse gas emissions or transportation impacts under Senate Bill 743.

CEQA requires feasible mitigation for projects deemed to have significant environmental impacts, and mitigation in the form of financial support for nature-based climate action with quantifiable sequestration benefits could help finance many of these projects. Examples include the establishment of a vehicle miles traveled mitigation bank or exchange under SB 743 (Steinberg, Chapter 386, Statutes of 2013) that helps fund the preservation of open space and other carbon sinks to avoid conversion to auto-oriented development, provided on-site mitigation measures have been exhausted by the project proponent seeking mitigation and that any funded projects adhere to strict and established standards regarding verifiability, enforceability, permanence and additionality. Lead agencies have discretion to establish such banks or exchanges under the statute.⁴⁶ Greenhouse gas mitigation could also provide a mechanism to fund similar preservation or investment in carbon sinks.

Solution: Federal and state leaders could make more lands eligible for carbon cap-and-trade offset protocols.

Offsets under programs like California's cap-and-trade program or other multi-state emission trading systems provide a mechanism for regulated entities to pay for off-site carbon reductions that are cheaper than reductions at the source. Federal lands are currently not eligible under federal law for these offset investments (Tribal lands, however, are eligible subject to certain requirements including limited waivers of sovereign immunity, and multiple Tribes are active participants in the market). Allowing federal lands to be eligible could potentially open a stream of funding for nature-based climate action, provided policy makers included safeguards to ensure these projects meet strict requirements regarding enforceability, additionality, and permanence, among other standard offset provisions, and that they involve local and other affected communities in the project design, including Tribes. State leaders at the California Air Resources Board and California Natural Resources Agency could work with federal partners and Tribes to identify requirements for federal land eligibility and propose any necessary amendments to federal law.

Solution: Local governments and insurers could develop innovative insurance models to bring private investment and community approaches to nature-based resilience and climate solutions.

Insurance instruments serve primarily to transfer the financial risk of a natural disaster or other high-cost event from a low-liquidity insured such as a business or homeowner to a high-liquidity financial institution. As climate risks become more imminent and intense, local governments and businesses are increasingly turning to insurance and related risk transfer instruments to manage their

financial impacts.⁴⁷ In addition to providing protection against catastrophic financial loss, these mechanisms and transaction structures can also provide incentives and capital for direct investment in nature-based climate solutions. Examples include parametric (i.e., index-and-trigger-based, rather than loss-based) insurance policies that pay for immediate repair to natural infrastructure damaged in climate-driven events⁴⁸ or include multi-jurisdiction risk pools and require participating governments to build disaster response capacity,⁴⁹ and “pay for success” environmental impact bonds that refund investors or the project sponsor if green infrastructure over- or under-performs.⁵⁰ While these mechanisms are largely untested outside the disaster response context, as local and regional governments develop more comprehensive climate risk frameworks—in which natural infrastructure investments are fully valued for their mitigation and resilience benefits—insurance could play a valuable financial support role.

Insurers and local governments could develop innovative structures that integrate policy elements such as community and regional risk pooling, premium reductions for mitigation investments, and natural infrastructure investments that offer multiple climate benefits.⁵¹ Local fire districts, building departments, and councils/boards of supervisors could collaborate to ensure that homeowners have access to the most current data on community-scale risk and the relationship between risk management and home insurance availability. In California, the legislature could also support these innovations with funding for pilot insurance projects in high-risk communities, while the Department of Insurance could assist by helping to identify public and private local stakeholders and willing insurers that might participate in risk pools. If implemented at community or regional scale, these risk transfer arrangements could fund and incentivize investment in both home/structure hardening and resilience-boosting natural infrastructure solutions.

BARRIER 2: LACK OF ADEQUATE DATA AND METRICS LIMITS DECISION-MAKING BY INVESTORS

Standardized metrics to calculate the impacts of nature-based projects have been insufficient to date to spur decision-making by investors, communities, project managers, policy makers, and others with a stake in project development. Without verification of impacts, project managers and funders alike have difficulty making the case for nature-based investments over traditional investments, as nature-based projects have more diffuse benefits realized a longer timescale. A measurement framework that quantifies the impacts of nature-based solutions could facilitate project comparison and inform decisions by potential investors. While several measurement frameworks exist, approaches tend to be underutilized in decision-making and often focus too narrowly on certain benefits—especially ones that are easily quantifiable on a project scale—leaving potential investment incentives unquantified. An analysis led by the Pacific Institute, The Nature Conservancy, CEO Water Mandate, and Danone presented a summary of existing benefit identification and accounting approaches across multiple categories, such as “people and community” or “energy.”⁵² The analysis found that businesses want to see verifiable and credible methods that quantify costs and benefits of different solutions.⁵³ Quantifying

a project's impact allows a more holistic comparison across different sectors, land uses, and asset classes. If applied clearly and consistently, such metrics can reduce uncertainty and enable more informed decision making so that the greatest benefits are achieved for each dollar invested, while also allowing proposed projects and potential investors to match based on shared goals.

Participants suggested that data and metrics can be improved in three categories: greenhouse gas emissions accounting, environmental impacts (e.g., water, biodiversity, pollinators) and community impacts (e.g., recreation, equity) accounting, and financial measurement and project design. Where possible, development of impact measurement approaches should draw from existing frameworks. Examples include the United Nations' System of Environmental-Economic Accounting (SEEA) and the Restore the Earth Foundation's EcoMetrics methodology.⁵⁴

Greenhouse gas emission accounting standardization can clarify the emissions impact of a project. Accurate and comprehensive greenhouse gas emissions accounting can help investors understand the direct climate mitigation impacts from sequestration (e.g., managing forests as a carbon sink) and avoided emissions (e.g., by reducing wildfires, which emit the carbon sequestered in forests). Benefits from nature-based solutions are not limited to climate mitigation; communities can also derive climate adaptation and resilience benefits (for example, a preserved wetland can reduce flooding after an intense storm or vegetation management can create wildfire buffer zones), and non-climate environmental and social benefits from projects (for example, wetland conservation can offer water quality improvements and increased access to recreational opportunities). Measurements that capture these broader social and environmental benefits would depict a potential project's full range of impact more accurately. Robust, standardized measurements also can improve project design and prioritization. Without standardized metrics, investors face difficulty drawing comparisons between nature-based projects and "grey" infrastructure projects—meaning human-built infrastructure like buildings or roads—for which measurements of impact, asset life, and return on investment are common and well understood. If government leaders and third-party firms could improve similar measurements and data for nature-based solutions, the value of these projects would become more apparent to potential investors and non-investors alike, driving financial, policy, and community support.

Solution: State leaders, such as the California Natural Resources Agency, could incorporate and develop financial data on all benefits of nature-based action to inform public funding decisions.

Nature-based action may produce multiple public benefits not currently measured in terms of their comprehensive financial impacts. For example, projects may provide public health benefits from reduced wildfire severity, cleaner energy production and enhanced recreational opportunities, as well as carbon sequestration or reduction benefits. Water availability can also impact greenhouse gas emissions but is not accounted for in greenhouse gas reduction needs, such as the impact of the lack or abundance of water

on hydroelectric generation that may result from climate action. Although quantification methodologies exist, methodologies to value benefits are still under development in some cases. State officials could help ensure these benefits improve financing and returns on investment by collecting relevant data, aligning them with financial values, and incorporating them into state funding policy, perhaps through the Governor's Office of Planning and Research (OPR) Integrated Climate Adaptation and Resilience Program, which is developing resiliency metrics. Leaders could also support the continued development of methods to value benefits.

Solution: The California Air Resources Board, in collaboration with California Natural Resources Agency, California Environmental Protection Agency, the Governor's Office of Planning and Research, and external institutions, could standardize and refine carbon accounting methods and greenhouse gas protocol framework across land uses, sectors, and asset classes to incorporate quantification of natural and working lands emissions and sequestration.

Some participants felt that while the California Air Resources Board and other state agencies have developed a robust set of tools to quantify carbon in natural and working lands, such as the Natural and Working Lands Inventory and cap-and-trade offset protocol, market actors still lack comprehensive methods to define the potential revenue-generating benefits of projects for investment. The California Air Resources Board could collaborate with the California Natural Resources Agency, the California Environmental Protection Agency, Governor's Office of Planning and Research, and external institutions to standardize and refine a greenhouse gas accounting framework for natural and working lands, focusing on greenhouse gas reduction benefits through sequestration, reduced emissions from lands, and co-benefits. This work could draw from the existing efforts of national and international organizations that are in the process of revising greenhouse gas accounting practices. Alignment with the ongoing updates of the Greenhouse Gas Protocol to account for land sector emissions, and the Science Based Targets initiative (SBTi) Forest, Land and Agriculture (FLAG) project's efforts to characterize land-related emissions can prevent duplication of efforts by California's agencies.⁵⁵ Any measurement framework should embody a holistic approach by including near-term and long-term net impacts that are not counted consistently in greenhouse gas emission estimates, such as water projects that have both direct emission benefits and impacts. Agencies could gather feedback from investors, project managers, and communities to ensure that the measurements presented are relevant to the needs of different parties.

Solution: State agencies (such as the California Natural Resources Agency or Governor’s Office of Planning and Research), with legislative support, could develop and standardize environmental and community impact accounting practices to inform investment choices.

Impact accounting practices could be enhanced by adopting methods to quantify non-greenhouse gas benefits, including reduction in wildfire risk, prevention of flooding and coastal erosion, local air quality improvements, water quality improvements, and long-term sustainability metrics, as well as resilience, public health, and quality-of-life benefits, especially for lower-income and disadvantaged communities. Quantifying these benefits as much as possible in the overall impact accounting not only enables communities and government agencies to prioritize projects they want to see funded first, but also allows investors to find projects that align with their goals and priorities, such as healthy soils or flood prevention. Quantification of a wide range of impacts illuminates the interconnection of benefits across sectors, showing stakeholders how a potential project might benefit not only climate goals but other environmental, social, and economic goals. The state legislature could direct appropriate agencies to develop guidelines for quantifying the non-greenhouse gas benefits of nature-based solutions. Example agencies to lead this work include the California Natural Resources Agency or Governor’s Office of Planning and Research, although other entities also may be positioned to implement these tasks.

Solution: The legislature could require the integration of climate impacts into infrastructure planning and the development of green infrastructure standards.

Legislation requiring climate-safe, science-based design standards for green infrastructure projects and planning would improve information availability while advancing project development. This action would catalyze financing by reducing uncertainty about a project’s lifespan and expected climate or economic impacts. Assembly Bill 2800, first enacted in 2016 and extended in 2020, could serve as a potential model for new legislation focused on green infrastructure.⁵⁶ The law requires state agencies investing in critical infrastructure projects to account for climate change impacts through engineering and design specifications. The law also established a Climate-Safe Infrastructure Working Group to develop recommendations for incorporating scientific climate change projections into infrastructure design. The AB 2800 working group presented its recommendations in 2018, including steps to build data analysis, project development, governance, and financing mechanisms that support climate-safe state infrastructure.⁵⁷ Legislators could consider creating similar requirements for green infrastructure planning processes, adapting the AB 2800 requirements and working group process to build a framework for natural infrastructure and conservation projects.

Solution: The California Environmental Protection Agency, Natural Resources Agency, and Governor’s Office of Planning and Research could ensure the adoption of statewide green infrastructure design standards that integrate nature-based solutions into state agencies’ existing decision-making framework.

Design standards would complement the goals of the framework legislation described above and remedy the existing discrepancy in nature-based project design standards, such as standards for habitat restoration, green infrastructure, or conservation projects. While “grey” infrastructure like roads or buildings have design standards and performance metrics that are widely applied and easy to conceptualize, green infrastructure projects could benefit from similar design and performance standards. Green infrastructure projects often struggle to win the attention or trust of investors when compared to grey infrastructure projects, as the latter have clear performance metrics that investors can use to inform decision making. But green infrastructure projects can offer long-term sustainability benefits that reduce their long-term costs relative to grey infrastructure. A metric to capture these benefits could catalyze financing for green infrastructure projects. Green design standards are also limited by a lack of engineers trained in green infrastructure design. State agency leaders could encourage academic institutions to build curricula tailored to green design standards and offer workforce training opportunities.

Solution: The legislature could dedicate funding to demonstration projects aimed at improving measurement and quantification practices.

Nature-based demonstration projects would allow real-world application of the performance measurements and accounting practices developed in the previous solutions, while also enabling investors to respond to the measurements presented in the project. A university could lead the measurement and impact monitoring process for an initial demonstration project or projects and could develop methods for updating measurements across a project’s lifetime as more information becomes available. The wide variety of potential demonstration projects—from soil health management practices on agricultural lands to the addition of urban green space—highlights the need for a variety of data collection and measurement approaches that assess a wide range of benefits, from property protection and business continuity to urban heat island reduction and public health improvements. Deploying multiple projects simultaneously could help researchers compare across benefit types to develop more comprehensive metrics while taking into account the unique attributes of each project type. If initial funding is limited to just one or two project types, the legislature could consult state agencies, researchers, non-profits, and community stakeholders to understand where the greatest data and knowledge gaps exist and prioritize funding accordingly.



BARRIER 3: MISALIGNMENT BETWEEN PROJECT STRUCTURES, PUBLIC PROCESSES, AND INVESTMENT NEEDS SLOWS THE DEVELOPMENT OF VIABLE FINANCIAL FRAMEWORKS

Despite the increasingly clear alignment between private financial incentives and the climate and ecosystem benefits of nature-based solutions, participants identified a set of gaps between project structures and needs for investment viability. Specifically, participants noted divergence along three key axes:

Project timeline: Many forest management and ecosystem restoration projects are designed to deliver benefits over multiple decades. Natural investments often take years to deploy, and resilience, air quality, and water quality benefits—not to mention climate benefits—can take decades to manifest. They also have a limited track record of delivering financial returns. Investment firms typically seek shorter return timelines (or greater certainty) and can obtain them in more traditional markets.

Project size: Most current projects are relatively small from a financial perspective, delivering investment returns that struggle to compete with more traditional investment opportunities, while still requiring the same level of due diligence and time to structure.

Stakeholder group scope: Most projects deliver benefits to a wide range of public and private stakeholders, including individual residents in nearby communities. This is a key social and ecological asset but a potential financial hurdle, since aligning diverse incentives and analytical capacities—for example, among local water utilities, mission-focused investors, and market-rate investors—can significantly complicate a transaction. Different investor classes expect different types of return on investment, ranging from zero to full market-rate, and many projects rely on a mix of flexible capital.

In addition, while the public benefits of nature-based climate actions are a core element of their potential financing capacity, the public processes needed to deliver them from concept to implementation can inhibit private investor participation. Participants cited the “green tape” of government permitting and planning processes, time-consuming endeavors that investors often are not interested in funding and which lengthen project timelines and increase due diligence costs. In addition, existing policy distinctions between funds for disaster prevention and disaster recovery—for example, limitations on uses of Federal Emergency Management Agency funding—can place further restrictions on project design and financing.

A growing market for nature-based climate solutions will address some of this misalignment over time, as investors and agencies become more familiar with transaction structures and projects increase in size. However, state and investment leaders can take certain steps to overcome this barrier in the near term.

Solution: Project developers and local governments could bundle and/or diversify nature-based climate actions to achieve investment scale and reduce risk.

Most current examples of financing for nature-based climate solutions, while encouraging, are small in scale relative to competing investment opportunities. For example, Blue Forest Conservation’s pioneering North Yuba River forest resilience bond raised \$4 million for ecological treatments in Northern California national forest lands, a significant investment in ecosystem restoration but a small-scale opportunity for major financial institutions.⁵⁸ While investment scale will likely increase as the market matures, participants emphasized the need to develop strategies to bundle and diversify actions in the near term in order to achieve scale, reduce risk, and attract more market-rate investment. Strategies include:

Blended finance. Nature-based climate solution investments may not offer as high a rate of return as some traditional infrastructure investments, at least in the near term. However, developers can craft financing structures that offer higher rates of return for market-rate investors and lower rates of return for concessionary sources, attracting a broader set of investors at lower overall returns. The North Yuba River forest resilience bond, which included mission-oriented foundations at one percent and market-rate investors at four percent, offers an example of this arrangement.⁵⁹ Blended finance structures are particularly appealing for nature-based investments, but they have been applied in a range of sustainable development-oriented sectors including housing, renewable energy, and public health.⁶⁰

Third-party management structures. Some participants suggested that contractual arrangements such as the energy service company (ESCO) structure—in which a third-party investor finances the upfront cost of a building retrofit, an ESCO performs the work and guarantees a minimum level of savings, and the owner returns a portion of the savings to the investor—could support aggregation of projects for investment scale. The participation of an experienced third party and ability to monetize a diverse set of projects simultaneously have the potential to decrease project investment risk substantially. Guaranteeing financeable performance could prove far more challenging in the natural climate investment context than in the home retrofit context, but the potential for multi-decade contracts could increase the certainty of ecosystem benefits.⁶¹

Integration with California’s carbon market. Forest conservation projects that guarantee real, quantifiable, enforceable, permanent, additional, and verified greenhouse gas emission reduction can generate offsets used for compliance with California’s cap-and-trade system (or in the voluntary offset market).⁶² Private forest asset managers like Forest Carbon Partners have developed US-based projects, including many in California, that conserve forest lands and monetize the value of the stored carbon by delivering offsets to businesses regulated under the cap-and-trade program.⁶³ This program provides highly valuable near-term financing for qualifying forest management projects (although the cap-and-trade program’s offset caps decline over time), suggesting a potential model to support other natural

carbon sequestration projects that are not currently covered by the offset protocol.

Leveraging green public finance. The California IBank provides direct financing to local governments, special districts, joint powers authorities, and other public entities investing in public infrastructure, including for environmental mitigation purposes.⁶⁴ While IBank loans traditionally have supported built infrastructure projects, natural infrastructure projects that reduce wildfire risk and/or greenhouse gas emissions in furtherance of state climate goals could potentially qualify for “climate catalyst project” funds (which are to be administered by the bank but have yet to be appropriated), creating an opportunity for public funds to supplement private investment.⁶⁵

Bundling and securitization. Participants noted successes in grouping smaller-scale climate change investments of similar type to build the scale needed to support securitization and issuance of green bonds. For example, Property Assessed Clean Energy (PACE) loan-backed securitizations have exceeded hundreds of millions of dollars based on thousands of residential and small commercial properties, generating significant mainstream bond investment opportunities.⁶⁶ Although residential PACE programs have received recent criticism for lending and auditing practices for lower-income customers, commercial programs have largely avoided these risks—and may already incorporate the enhanced verification and monitoring of project benefits needed to address program shortcomings.⁶⁷ While natural infrastructure investments present a unique financing challenge, development of standard definitions, project design criteria, and carbon accounting methods as discussed in the prior section will significantly increase the feasibility of large-scale pooling. Participants also cited the IBank and Forest Carbon Partners as successful examples of bundling smaller projects to access capital markets.

Corporate engagement. Large corporate sectors such as commodity agriculture and commercial fisheries, as well as more local industries such as wineries, tourism, and outdoor recreation, could provide significant capital to back investment in natural and working lands based on their direct interest in sustainable water supplies and broader ecosystem resilience. Local governments could engage with regional industry partners to identify areas of overlap between potential natural climate solution projects and capacity to provide supporting investments.

Solution: State legislators and the California Department of Insurance could develop mechanisms to increase the insurability of forest and watershed assets.

Long-term direct investment in forest management projects could face a direct challenge if wildfire risk becomes uninsurable in heavily forested areas of California, an increasingly realistic threat as recent record-setting wildfire seasons have begun to reduce insurance affordability and availability throughout the state’s high-risk areas.⁶⁸ Even the most well-managed forest areas face

substantial wildfire risk in California, and investors and project funders may be simply unable to commit substantial capital to projects (including sustainable forest management and prescribed burns) that cannot obtain reasonably priced insurance covering the forest project assets and/or activities. To address this risk, state legislators could consider legislation to require insurers to guarantee availability of insurance for agricultural or forest management activities that follow a series of appropriate mitigation measures certified by the California Department of Insurance, similar to 2020's proposed Assembly Bill 2367 (Gonzalez) for residential property insurance; or to build on 2018's Senate Bill 824 (Lara, Chapter 616) and 894 (Dodd, Chapter 618), which require policy renewals in case of certain catastrophic losses.³⁹

Solution: State legislators and public pension leaders could promote investment in nature-based climate action that aligns with long-term funding goals.

Some participants also highlighted the potential for public pension funds to lead large-scale investment in natural climate solutions due to their longer-term investment timelines than many market investors. CalPERS and CalSTRS, California's two largest public employee pension funds, together manage over \$600 billion in assets and both have taken nation-leading steps to reduce climate risk and increase sustainable investment in their portfolios.⁷⁰ State lawmakers have spurred this leadership with legislation requiring the funds to disclose the climate-related financial risks of their investments and to divest from thermal coal.⁷¹ CalPERS and CalSTRS could consider investment in California natural infrastructure projects in order to further reduce portfolio climate risk, accelerate long-term net zero asset goals, and advance sustainability goals for the state as well as beneficiaries' communities.⁷² State legislators could also consider refining disclosure requirements or directing assessment of natural climate solution investment opportunities to support this effort, building on the work on state investment and asset stewardship begun by the Climate-Related Risk Disclosure Advisory Group pursuant to Executive Order N-19-19 and the subsequent California Climate Investment Framework.⁷³

While the public benefits of nature-based climate actions are a core element of their potential financing capacity, the public processes needed to deliver them from concept to implementation can inhibit private investor participation. Participants cited the "green tape" of government permitting and planning processes, time-consuming endeavors that investors often are not interested in funding and which lengthen project timelines and increase due diligence costs. In addition, existing policy distinctions between funds for disaster prevention and disaster recovery—for example, limitations on uses of Federal Emergency Management Agency funding—can place further restrictions on project design and financing.

Solution: Resource managers could conduct advance planning and permitting for multiple potential projects to create “portfolios” for grantors and investors to finance.

Some participants emphasized private investors’ and funders’ lack of interest in funding a state agency’s work in research, stakeholder outreach, planning and design, and permitting and legal compliance, preferring to fund only direct project deployment costs. A project sponsoring agency may have difficulty obtaining substantial private investment if it is unable to present “shovel-ready” project proposals. To minimize this risk, state land and resource managers can conduct these due diligence activities in advance to create project portfolios for presentation to investors/partners, contingent upon data availability about the potential projects’ benefits. State legislators could support these efforts by state and local agencies with grant funding opportunities or direct appropriations to establish some examples of portfolios and demonstrate the value of investment in advance review. A state-level project clearinghouse, similar to that proposed for energy efficiency projects under Assembly Bill 383 (Mayes, 2019), could also facilitate rapid development of investment-ready project proposals. Some participants also suggested creation of regional or county-level “one-stop shops” to streamline obtaining permits for nature-based climate projects, following examples like the Energy Trust of Oregon, a one-stop-shop for energy efficiency incentive access, and the Sonoma County Resiliency Permit Center, which the county created to fast-track review and approval of residential rebuilding projects in the aftermath of catastrophic wildfires.⁷⁴



V. CONCLUSION: SUSTAINABLE INVESTMENT IN NATURE-BASED ACTION IS KEY TO LONG-TERM CLIMATE GOALS AND NEAR-TERM RESILIENCE

As climate change impacts worsen, nature-based action will be required to ensure both near-term resilience to extreme weather events like fires and floods, as well as to mitigate climate change by reducing emissions and sequestering greenhouse gases in a cost-effective manner. While there is a significant gap between the funding available to implement these actions and the current scale of the need, a range of financial innovations and supporting policy steps can begin to marshal the necessary public and private resources. California has an opportunity to pilot uptake of these measures, given its combination of strong policies promoting proactive climate mitigation and adaptation and statewide need for nature-based climate action. Financing structures piloted in California can help streamline and encourage adoption beyond the state's borders, while potentially addressing economic inequalities and quality-of-life concerns in the state. Ultimately, developing these mechanisms in California can facilitate carbon mitigation and increase resilience nationwide.

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