

Draft Cap-and-Trade Auction Proceeds Fourth Investment Plan

Fiscal Years 2022-23 through 2024-25

Draft for Public Comment

Draft Release Date: August 19, 2021
Comments Due: September 17, 2021



**Draft Cap-and-Trade Auction Proceeds Fourth Investment Plan:
Fiscal Years 2022-23 through 2024-25**

PUBLIC INPUT

Workshop

A public workshop will be held on September 2 to obtain public input in response to the Draft Cap-and-Trade Auction Proceeds Fourth Investment Plan: Fiscal Years 2022-23 through 2024-25. Information on the workshop is available at:

<https://ww2.arb.ca.gov/resources/documents/california-climate-investments-investment-plan>.

Comments

Please submit written comments on this draft by September 17 to:

[https://www.arb.ca.gov/lispub/comm2/bcsubform.php?listname=4thinvestmentplan-
ws&comm_period=1](https://www.arb.ca.gov/lispub/comm2/bcsubform.php?listname=4thinvestmentplan-
ws&comm_period=1)

Public Hearing

The California Air Resources Board will conduct a public hearing to discuss a revised version of this document in Fall 2021.

ADDITIONAL INFORMATION

For more information on California Climate Investments, visit:

<http://www.caclimateinvestments.ca.gov/>

To view previous Investment Plans, visit:

<https://ww2.arb.ca.gov/resources/documents/california-climate-investments-investment-plan>

To receive notices of upcoming meetings or availability of documents, please subscribe to the electronic list serve by clicking the "Subscribe" button on the program webpage at:

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Executive Summary

As California works to achieve its ambitious climate goals, incentive funding plays a critical role in deploying new climate smart technologies and practices, reducing barriers to adoption, and providing near-term emissions reductions. Many climate mitigation and resiliency strategies are deeply interconnected to other state policy priorities, including providing safe and affordable housing for all Californians, promoting a just transition to a carbon-neutral future, advancing environmental justice, improving public health, and building an equitable and prosperous economy. Effectively addressing climate change necessitates addressing multiple objectives simultaneously.

When making funding decisions, the state has the opportunity to deploy climate incentive funding in ways that contribute towards an integrated set of environmental, economic, and social goals. The Cap-and-Trade Auction Proceeds Fourth Investment Plan (Fourth Investment Plan or Plan) is designed as a tool to identify priority investments that can achieve multiple benefits and advance the state's multi-faceted goals.

The Plan builds on years of implementation of California Climate Investments – a statewide initiative that funds a wide range of climate incentive programs using proceeds generated by the Cap-and-Trade Program. The Cap-and-Trade Program is a market-based system that establishes an annual declining limit – or cap – on about 80 percent of statewide greenhouse gas (GHG) emissions from the largest polluters (“covered entities”) in the state. Covered entities must obtain allowances equal to their emissions. Allowances are purchased at quarterly auctions, which generates proceeds. The state's share of the auction proceeds is deposited into the Greenhouse Gas Reduction Fund (GGRF), which the Legislature appropriates to state agencies to implement California Climate Investments programs.

California Climate Investments is a core component of California's climate funding strategy. The GGRF supports activities that facilitate GHG emissions reductions and deliver a variety of important co-benefits (e.g., public health improvements, improved resiliency to climate impacts), with a focus on providing benefits to disadvantaged communities and low-income communities and households, collectively referred to as “priority populations.” Under current law, several long-term commitments limit the share of the GGRF available for annual appropriations. Approximately 65 percent is continuously appropriated to specific programs focused on transit and High-Speed Rail, affordable housing and sustainable communities (including through agricultural land conservation), and safe and affordable drinking water, and therefore not subject to annual appropriations through the budget process.¹ Statute also commits \$200 million per year through Fiscal Year (FY) 2023-24 to forest health and fire prevention, along with certain additional obligations.² The remainder of the funding is appropriated through the annual budget process towards other California Climate Investments programs that advance the state's climate goals.

¹ Senate Bill (SB) 862 (Committee on Budget and Fiscal Review, Chapter 36, Statutes of 2014) and SB 200 (Monning, Chapter 120, Statutes of 2019).

² Assembly Bill (AB) 398 (E. Garcia, Chapter 135, Statutes of 2017) and SB 901 (Dodd, Chapter 626, Statutes of 2018).

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Health and Safety Code Section 39716 (a) requires the Department of Finance, in consultation with the California Air Resources Board (CARB) and other state agencies, to submit a plan to the Legislature every three years to guide the investment of funds from the GGRF. The Fourth Investment Plan is due to the Legislature in January 2022 and will guide the investment of Cap-and-Trade auction proceeds for FY 2022-23 through 2024-25.

Overview of Greenhouse Gas Reduction Fund Statutory Framework

Current law establishes a robust framework for programs that receive funding from the GGRF. Assembly Bill (AB) 1532 (Pérez, Chapter 807, Statutes of 2012) requires investments to facilitate GHG emissions reductions and, where applicable and to the extent feasible:

- Maximize other economic, environmental, and public health benefits.
- Foster job creation.
- Complement efforts to improve air quality.
- Direct investments toward disadvantaged communities.
- Provide opportunities for community institutions to participate in and benefit from GHG emission reduction efforts.
- Lessen the impacts of climate change.

AB 1532 also identifies foundational funding priority investment areas that establish direction for investments moving forward while providing flexibility for emerging opportunities, including but not limited to:

- Energy efficiency and renewable energy.
- Low-carbon transportation, freight, and advanced technology and fuels.
- Natural resources, including water use and supply, land conservation, forestry, and sustainable agriculture.
- Strategic planning for sustainable infrastructure, including transportation and housing.
- Reduction, diversion, and reuse of waste.
- Partnerships for local and regional implementation.
- Research, development, and deployment of innovative technologies and practices.

AB 398 (E. Garcia, Chapter 135, Statutes of 2017) augments the foundational priorities with seven complementary funding priorities that provide additional direction for future investments, including but not limited to:

- Air toxic and criteria air pollutants from stationary and mobile sources.
- Low- and zero-carbon transportation alternatives.
- Sustainable agricultural practices.
- Healthy forests and urban greening.
- Short-lived climate pollutants.
- Climate adaptation and resiliency.
- Climate and clean energy research.

The Plan identifies investment opportunities that support the full range of statutory priorities, including AB 398 priorities and other applicable statute.

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Overview of State Climate Goals and Investment Needs

California has an economy-wide target to reduce GHG emissions to at least 40 percent below 1990 levels by 2030 and a goal to achieve carbon neutrality no later than mid-century. Governor Gavin Newsom has issued several key climate-related Executive Orders (EOs), including: EO N-19-19,³ which included several new directives for transportation strategies and focused on leveraging state operations and transportation spending to promote climate goals; EO N-79-20,⁴ which sets a path forward to decarbonize the transportation sector and directs state agencies to develop a roadmap for a just transition away from fossil fuels; and EO N-82-20,⁵ which outlines a results-oriented nature-based solutions agenda to support California's climate goals.

The timeframe the Fourth Investment Plan covers represents a critical period for California to make necessary investments that transition away from fossil fuels and set the path forward towards carbon neutrality. The Plan discusses strategies that are consistent with these long-term goals and identifies where investments are needed to accelerate progress in a variety of sectors including: sustainable transportation and communities; low-carbon energy, buildings, and industry; natural and working lands; livestock; waste diversion; and water. The Plan also identifies cross-sectoral investment needs, like capacity building, technical assistance, workforce development, and research, that support implementation of climate strategies across sectors.

Guiding Principles for Prioritizing Investments

The goal of the Fourth Investment Plan is to identify investment priorities that achieve a variety of policy objectives simultaneously and contribute towards an integrated set of environmental, economic, and social goals. The Plan proposes the following guiding principles, based on existing statutory directives for the GGRF and input from stakeholders, to provide high-level criteria for prioritizing investments, and identifying opportunities to maximize benefits:

- Support implementation of state climate goals.
- Advance equity and environmental justice.
- Improve public health.
- Support a climate-resilient and prosperous economic future.
- Foster interagency coordination.

To develop recommendations, the Plan analyzes the potential for over 30 investment types to support the guiding principles using over 20 individual metrics (e.g., GHG cost-effectiveness, benefits to priority populations, reducing heat exposure, improved resiliency to climate impacts, providing cost savings). The analysis draws from years of California Climate Investments reported data and lessons learned from program implementation.

³ Full text available at: <https://www.gov.ca.gov/wp-content/uploads/2019/09/9.20.19-Climate-EO-N-19-19.pdf>.

⁴ Full text available at: <https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf>.

⁵ Full text available at: <https://www.gov.ca.gov/wp-content/uploads/2020/10/10.07.2020-EO-N-82-20-.pdf>.

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Recommended Funding Priorities

The Plan includes six recommendations that collectively represent a coordinated strategy to advance the guiding principles and achieve multiple benefits from climate incentives.

1. Fund investments in key sectors that support GGRF statutory priorities and drive progress on state climate goals.

The Plan recommends a set of investment types that are funded through existing programs to prioritize for GGRF funding. The Plan also recommends considering using GGRF to fund pilot investments for a limited set of emerging opportunities, which could be funded through existing or new programs. These recommendations support priorities identified in AB 398 for GGRF appropriations and prioritize technologies and practices in key sectors to drive progress on state climate goals. Funding of priorities identified in this plan are subject to the availability of GGRF revenue and future budgets may not necessarily include all of these investment opportunities. Table 1 summarizes the sector-specific GGRF investment priorities.

2. Provide dedicated funding to advance equity, environmental justice, and community participation.

Providing resources for staff, equipment, and operations can enable community-based organizations and other entities to meaningfully participate in state climate programs and build local partnerships that can sustain progress over time. To support local leadership and decision-making, and ensure that climate incentive projects reach priority populations and other underserved communities, the Plan recommends exploring funding through existing programs to support community-based organizations, local and regional governments, and tribal governments for:

- Capacity building and technical assistance, including technical assistance for program types identified in the Strategic Growth Council (SGC)'s Technical Assistance Guidelines.
- Community-level planning and needs assessments.
- Flexible pots of funding to implement plans.
- Outreach related to awareness and education.

Complementary strategies to support partnership building and enable meaningful community can help these investment types achieve their goals. For example, programs that involve community collaboration and partnership can take time, and establishing longer timeframes for program development and implementation can help broaden outreach efforts and enable agencies to build relationships with local communities. Additional opportunities to help ensure that these programs are community-driven and enable community participation include: contracting and sub-contracting with community partners to enable local, community-specific outreach, program design, and implementation; reducing the need for underfunded organizations, low-income households, and low-income individuals to provide funds upfront by exploring advance payment where appropriate; and enabling meeting participation.

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State agencies have implemented these strategies to varying degrees. The state can explore expanded opportunities to address existing barriers and incorporate these important practices into a broader set of equity-focused programs.

3. Direct funding towards high-quality jobs and high road workforce development.

The state has established clear priorities to promote high road jobs and a just transition to a carbon-neutral economy, presenting significant opportunities for the state to proactively advance workforce development and job training approaches that provide high-quality jobs and support low-carbon technologies and sectors. To implement these goals, the Plan recommends advancing programs that:

- Provide funding to workforce development programs and support expansion of workforce development efforts into more investment types in coordination with other state and federal workforce dollars, particularly in sectors where there are opportunities to create or support pathways to high road jobs and where sustained job growth is occurring, planned, or expected.
- Incorporate job quality and job access measures (e.g., standards, requirements, and targets) across more investment types, prioritizing investment types that directly support or create jobs.

4. Integrate nature-based solutions and zero-emission technologies into investment types across sectors.

To maximize benefits from a broader set of investment types, the Plan recommends state agencies:

- Integrate nature-based climate solutions into community adaptation plans and infrastructure investments, including transportation, housing, and energy infrastructure initiatives where possible. Example opportunities include:
 - planting and maintaining trees and vegetation along roadways, surface parking lots, and along bike and pedestrian paths;
 - “greening” traditionally “grey” infrastructure (e.g., green storm and wastewater management, green flood protection, green roofs); and
 - installing parks, community gardens, or greenways.
- Incorporate zero-emission technologies wherever possible across state investments. Example opportunities include:
 - using zero-emission vehicles, equipment, and infrastructure in transit and waste diversion projects;
 - incorporating renewable energy generation into housing and transit projects;
 - prioritizing electric appliances as part of energy efficiency retrofits;
 - using low- or ultra-low-GWP technologies wherever feasible for projects that involve refrigeration, air conditioning, or heat pump technologies;
 - considering zero-emission infrastructure in local and regional plans; and
 - constructing all-electric affordable housing.

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5. Support policy-relevant research and program evaluation tied to emissions-reducing projects.

AB 398 identifies climate and energy research as a funding priority for GGRF. Research and program evaluation are both important components of a holistic climate funding portfolio. Research can provide an array of insights to help individual programs and the state more broadly identify emerging emissions reduction strategies, assess unintended consequences from investments, and estimate additional benefits. Coupling research activities with emissions-reducing projects can ensure that they provide valuable, policy-relevant insight while providing tangible, on-the-ground benefits. Program evaluation is equally important and can help the state understand the specific impacts and effectiveness of individual programs, whether the programs are achieving their goals, whether the intended populations and communities are receiving the intended benefits, and how to adjust programs to ensure the best use of state incentive dollars.

The Plan recommends advancing research and program evaluation activities with the GGRF by:

- Exploring funding for applied policy-relevant research tied to emissions reduction projects and developed collaboratively in coordination with state agencies and stakeholders, including community residents.
- Providing for policy-relevant program evaluation, including data collection for implemented projects, at the project and program level as an eligible component of GGRF appropriations, as appropriate.

6. Advance support for priority populations and other underserved communities.

To help increase the amount of resources supporting equity goals, the Plan recommends:

- Exploring opportunities to increase the portfolio-wide priority population targets.
- Exploring investment minimums to include additional population segments (e.g., tribal governments, rural areas, socially disadvantaged farmers, climate vulnerable communities) beyond existing priority population definitions for specific programs in limited, context-specific applications.

Recommended Metrics

Agencies administering California Climate Investments programs report extensive information on project implementation and benefits, and the Plan relies heavily on this information to develop recommendations. The identified metrics the Plan uses represent important, foundational data points for understanding benefits from climate strategies.

However, as California continues its efforts to improve racial and social equity, address environmental justice, promote public health and resiliency, and support high-quality jobs and a just transition, there are opportunities to enhance the data that administering agencies collect and report on, both within the California Climate Investments framework and beyond.

The Plan recommends the state explore the following additional metrics for state climate incentive programs, as appropriate, to enhance the state's ability to evaluate investments,

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determine whether programs are meeting their objectives, understand who is benefiting from projects, and improve implementation:

- Public health metrics, including but not limited to those already identified in the Plan, to quantify additional benefits (e.g., health benefits from reduced commute time) and target investments in a manner that maximizes public health benefits.
- Data on race, ethnicity, gender identity, socioeconomic status, and other demographic data of grant applicants and recipients to help agencies better understand and address disparities in their programs, consistent with state and federal law.
- Additional qualitative and quantitative job quality metrics to understand labor market outcomes associated with investments.
- Additional data on public health and climate benefits associated with implementation of nature-based climate solutions.
- Additional equity metrics at the project level to evaluate how programs contribute to equity goals and support identification of unintended consequences (e.g., residential displacement).

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Table 1. Recommended Sector-Specific Investment Priorities for the GGRF.

Sector	Recommended Investment Priorities	AB 398 Priorities Supported
Sustainable Transportation and Communities	<ul style="list-style-type: none"> • Active transportation investments including community-scale projects aligned with community planning efforts and consumer-focused incentives for rideables (e.g., electric bicycles). • Affordable, energy-efficient, infill housing development that helps reduce vehicle miles traveled, consistent with existing continuous appropriations, with a focus on all-electric buildings. • Zero-emission shared mobility options and services aligned with community planning efforts. • Transit and rail services, including High-Speed Rail, consistent with existing continuous appropriations, with a focus on zero-emission technologies for buses, ferries, passenger locomotives, and supporting infrastructure. • Zero-emission vehicles and equipment, in coordination with non-GGRF sources of funding, prioritizing: <ul style="list-style-type: none"> ◦ Equity-based light-duty investments. ◦ Grants for small medium- and heavy-duty vehicle fleets in communities facing air quality challenges. ◦ Off-road incentives, including both freight and non-freight applications in communities facing air quality challenges. ◦ Demonstration of zero-emission off-road equipment and vehicles, including but not limited to agricultural and construction equipment, marine vessels, and locomotives. 	<ul style="list-style-type: none"> • Air toxic and criteria air pollutant reductions from mobile sources. • Low- and zero-carbon transportation alternatives.
Low Carbon Energy, Buildings, and Industry	<ul style="list-style-type: none"> • Innovative industrial emissions reduction projects, such as energy efficiency, renewable energy, electrification, and other efforts to replace fossil fuels (e.g., incorporation of renewable natural gas or hydrogen from low-carbon sources for sectors that will be difficult to electrify), funded through existing programs and prioritizing projects that maximize local air pollution benefits at facilities that do not receive other state incentives. • Consumer-focused incentives and financing assistance for building electrification at existing buildings as appropriate, funded through new or existing programs. • Consumer incentives and demonstration funding to support advanced back-up power technologies in a variety of applications through new or existing programs, prioritizing zero-emission technologies and low-carbon energy sources where possible. • Refrigerant emissions reductions, including full refrigeration system conversions, focusing on small-scale and independent grocers located in priority populations. 	<ul style="list-style-type: none"> • Air toxic and criteria air pollutant reductions from stationary sources. • Short-lived climate pollutant reductions. • Climate adaptation and resiliency.

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Sector	Recommended Investment Priorities	AB 398 Priorities Supported
Natural and Working Lands	<ul style="list-style-type: none"> • Nature-based solutions to accelerate climate smart management of California’s natural and working landscapes, consistent with the forthcoming California’s “Natural and Working Lands Climate Smart Strategy,” such as support for: <ul style="list-style-type: none"> ○ Forest health. ○ Sustainable agricultural practices (e.g., soil health practices). ○ Urban and community forestry and greening. ○ Restoration of wetlands and riparian areas. 	<ul style="list-style-type: none"> • Sustainable agricultural practices. • Healthy forests and urban greening. • Short-lived climate pollutant reductions. • Climate adaptation and resiliency.
Livestock	<ul style="list-style-type: none"> • Alternative manure management to support methane reductions at smaller dairies or dairies that may not be appropriate for a digester. • Anaerobic digestion of dairy manure projects that consider and work to address overall local impacts including air pollution, water pollution, and odor, with particular emphasis on projects that provide biomethane for difficult-to-decarbonize sectors. • Pilot efforts to reduce livestock enteric fermentation emissions, funded through new or existing programs, depending on the design. 	<ul style="list-style-type: none"> • Short-lived climate pollutant reductions.
Waste Diversion	<ul style="list-style-type: none"> • Food waste prevention and rescue. • Compost production, with a portion dedicated to community composting projects. • Anaerobic digestion of municipal waste projects that minimize local impacts. • Recycling infrastructure for non-organic waste. 	<ul style="list-style-type: none"> • Short-lived climate pollutant reductions.

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Introduction

Achieving California's ambitious climate change goals will require strategic implementation of programs to rapidly reduce greenhouse gas (GHG) emissions, support a just transition to a low-carbon economy, and deliver on other key equity, public health, economic, and environmental goals. Incentive dollars play an important role in developing and deploying new technologies and practices, reducing barriers to adoption, understanding and integrating community needs and participation into climate action, and providing models for other states and jurisdictions around the world.

California Climate Investments – a statewide initiative that funds a wide range of climate mitigation and resiliency projects using proceeds generated by the Cap-and-Trade Program – is one of the core components of California's climate funding strategy. The Cap-and-Trade Auction Proceeds Fourth Investment Plan (Fourth Investment Plan or Plan) will guide the investment of Cap-and-Trade auction proceeds for Fiscal Year (FY) 2022-23 through 2024-25 to support key state priorities. The public is invited to comment on this document, the Draft Cap-and-Trade Auction Proceeds Fourth Investment Plan, to inform recommendations included in the final version submitted to the Legislature.

California Climate Investments Background

The Cap-and-Trade Program is a market-based system that establishes an annual declining limit – or cap – on about 80 percent of statewide greenhouse gas (GHG) emissions from the largest polluters ("covered entities") in the state. Covered entities must obtain allowances equal to their emissions. Allowances are purchased at quarterly auctions, which generates proceeds. The state's share of the auction proceeds is deposited into the Greenhouse Gas Reduction Fund (GGRF), which the Legislature appropriates to state agencies to implement California Climate Investments programs.⁶ Since 2014, the Legislature has appropriated over \$15 billion from the GGRF to over 20 state agencies to support a diverse set of programs that facilitate GHG emissions reductions and deliver a variety of co-benefits like improved air quality, energy and transportation cost-savings, ecosystem services (e.g., drought resilience, recreation, biodiversity), and many others. Investments cover virtually every sector of the economy and support a project pipeline that includes research, capacity building, planning, technology demonstration and pilots, and project deployment.⁷

Each year, the Legislature and the Governor work together to develop an expenditure plan for GGRF dollars. Under existing statute, several long-term commitments significantly limit the fraction of the GGRF available for annual appropriations through the budget process. Approximately 65 percent of the GGRF is continuously appropriated to specific programs

⁶ Electrical distribution utilities and natural gas suppliers receive free allowances under the Cap-and-Trade Program on behalf of their rate payers. Investor-owned electric distribution utilities and natural gas suppliers must consign all, or some, allowances to be sold at quarterly auctions, use their auction proceeds for the benefit of ratepayers, and annually report to the California Air Resources Board on how the funds were spent. The primary use of these auction proceeds has been to fund distributions to ratepayers. Utilities have also established energy efficiency and renewable energy programs. For information on the use of investor-owned utility auction proceeds, visit: <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/allowance-allocation/edu-ngs>.

⁷ For additional information, visit <http://www.caclimateinvestments.ca.gov/>.

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focused on transit and High-Speed Rail, affordable housing and sustainable communities, land conservation, and safe and affordable drinking water, and therefore not subject to annual appropriations through the budget process.⁸ Statute also commits \$200 million per year through FY 2023-24 to forest health and fire prevention, along with certain additional obligations.⁹

Greenhouse Gas Reduction Fund Statutory Framework

AB 1532 (Pérez, Chapter 807, Statutes of 2012) establishes a robust framework for programs that receive funding from the GGRF, requiring that investments facilitate GHG emissions reductions and, where applicable and to the extent feasible:

- Maximize other economic, environmental, and public health benefits.
- Foster job creation.
- Complement efforts to improve air quality.
- Direct investments toward disadvantaged communities.
- Provide opportunities for community institutions to participate in and benefit from GHG emission reduction efforts.
- Lessen the impacts of climate change.

AB 1532 also identifies a set of foundational priority investment areas, which establish direction for GGRF investments while providing flexibility for emerging opportunities, including but not limited to:

- Energy efficiency and renewable energy.
- Low-carbon transportation, freight, and advanced technology and fuels.
- Natural resources, including water use and supply, land conservation, forestry, and sustainable agriculture.
- Strategic planning for sustainable infrastructure, including transportation and housing.
- Reduction, diversion, and reuse of waste.
- Partnerships for local and regional implementation.
- Research, development, and deployment of innovative technologies and practices.

AB 398 (E. Garcia, Chapter 135, Statutes of 2017) augments the foundational priorities with seven complementary funding priorities that provide additional direction for future investments, including but not limited to:

- Low- and zero-carbon transportation alternatives.
- Sustainable agricultural practices.
- Healthy forests and urban greening.
- Short-lived climate pollutants.
- Climate adaptation and resiliency.
- Climate and clean energy research.

⁸ Senate Bill (SB) 862 (Committee on Budget and Fiscal Review, Chapter 36, Statutes of 2014) and SB 200 (Monning, Chapter 120, Statutes of 2019).

⁹ Assembly Bill (AB) 398 (E. Garcia, Chapter 135, Statutes of 2017) and SB 901 (Dodd, Chapter 626, Statutes of 2018).

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In addition to these investment priorities, there are investment targets for the California Climate Investments portfolio, requiring that at least 35 percent of funding go towards projects located in and benefiting disadvantaged communities and low-income communities and households, collectively referred to as “priority populations.”¹⁰ The priority population investment targets are a core component of the program, and investments have consistently exceeded the minimum levels.

To ensure that statutory requirements are met, the California Air Resources Board (CARB) develops guidance on reporting and quantification methods for state agencies that receive GGRF funds.¹¹ Collectively, the foundational priorities, key investment areas, and data collection and reporting procedures establish a transparent, flexible structure for the state to invest in projects that support multiple state goals simultaneously, with a core focus on GHG reductions and advancing social equity.

While the GGRF is one of the primary sources of climate-related incentive funding in California, many other federal, state, and local programs, along with private sector funding, complement these investments. Moving forward, identifying opportunities to align investments towards shared goals and integrate climate considerations across a wide range of governmental activities will be important to drive meaningful progress towards a more sustainable, equitable California.

Investment Plan Statutory Requirements

To guide the investment of Cap-and-Trade auction proceeds, Health and Safety Code section 39716¹² requires the Department of Finance, in consultation with CARB and other state agencies, to submit an Investment Plan to the Legislature every three years that:

- Identifies the state’s near-term and long-term GHG emissions reduction goals and targets by sector, and analyzes gaps, where applicable, in current state strategies to meeting the goals.
- Identifies priority programmatic investments of moneys that will facilitate the achievement of feasible and cost-effective GHG emission reductions toward the achievement of GHG emissions reduction goals and targets by sector, consistent with requirements and priorities described in statute.
- Assesses how proposed investments interact with current state regulations, policies, and programs, and evaluates if and how those proposed investments could be incorporated into existing programs.
- Recommends metrics that would measure progress and benefits from the proposed programmatic investments.

Statute provides that annual GGRF appropriations be consistent with the Investment Plan. The Investment Plan’s statutory requirements also establish the minimum investment levels for priority populations that apply to the California Climate Investments portfolio.

¹⁰ AB 1550 (Gomez, Chapter 369, Statutes of 2016).

¹¹ SB 862 (Committee on Budget and Fiscal Review, Chapter 36, Statutes of 2014).

¹² AB 1532 (Pérez, Chapter 807, Statutes of 2012)

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The Department of Finance has issued three prior Investment Plans. The First and Second Investment Plans, covering FY 2013-14 through 2015-16 and FY 2016-17 through 2018-19 respectively, both identified investment priorities for sustainable transportation and communities, energy efficiency and clean energy, and natural resources and waste diversion. The Third Investment Plan, covering FY 2019-20 through 2021-22, recommended that the Legislature:

- Continue to invest in existing programs and prioritize programs that:
 - Emphasize meaningful community input in program modifications and project solicitation and design, and fund community-led projects, both community-wide and small-scale.
 - Achieve near-term climate and health benefits and contribute to long-term transformation to low-carbon communities and ecosystems that are adaptable and resilient.
- Provide funding certainty over multiple years for more of the existing California Climate Investments programs to better support legislative priorities.
- Support job training and apprenticeship opportunities, with a focus on disadvantaged communities, to provide the state's workforce with the job skills necessary to transition to a low-carbon economy.

Developing the Fourth Investment Plan

The Fourth Investment Plan is due to the Legislature in January 2022 and will apply to funding appropriated in FY 2022-2023 through 2024-25. Several recent trends informed the development of the Plan. In recent years, Californians have faced increasing threats from climate change including extreme heat, destructive wildfires, poor air quality, sea-level rise, and severe drought. In many cases, low-income communities and communities facing disproportionate environmental burdens are particularly vulnerable to climate events and may lack adequate resources to prepare, respond, or recover.

In recognition of the ongoing climate crisis, California has continued to pursue ambitious climate action. Governor Gavin Newsom has issued several key climate-related Executive Orders (EOs), including: EO N-19-19,¹³ which included several new directives for transportation strategies and focused on leveraging state operations and transportation spending to promote climate goals; EO N-79-20,¹⁴ which sets a path forward to decarbonize the transportation sector and directs state agencies to develop a roadmap for a just transition away from fossil fuels; and EO N-82-20,¹⁵ which outlines a results-oriented nature-based solutions agenda to support California's climate change goals. These EOs provide clear policy direction for the state, building on a strong foundation of existing efforts. As California continues its efforts to mitigate climate change and adapt to its impacts, the federal government has demonstrated a renewed commitment to tackling the climate crisis, presenting new opportunities for integrated policy development and spending to support climate progress.

¹³ Full text available at: <https://www.gov.ca.gov/wp-content/uploads/2019/09/9.20.19-Climate-EO-N-19-19.pdf>.

¹⁴ Full text available at: <https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf>.

¹⁵ Full text available at: <https://www.gov.ca.gov/wp-content/uploads/2020/10/10.07.2020-EO-N-82-20-.pdf>.

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The Plan proposes opportunities to deploy climate funding in ways that support state climate goals while addressing historic inequities. The Plan also builds on years of implementation from California Climate Investments. Because the amount of GGRF funding available for the Legislature to appropriate varies depending on the demand for Cap-and-Trade allowances, the Plan does not recommend specific funding amounts for investments. Rather, the Fourth Investment Plan serves as a prioritization tool under a variety of funding scenarios.

Coordination and Public Process

The Department of Finance and CARB staff conducted focused stakeholder outreach through over 40 separate meetings with state agencies and external stakeholders to obtain early input on the content and outreach process for development of the Plan. CARB presented initial guiding principles during a public workshop on February 23, 2021.¹⁶ The workshop, which drew over 130 participants, included guest speakers from CARB, the California Natural Resources Agency, the California State Transportation Agency, ClimatePlan, Coalition for Clean Air, and the Greenlining Institute. CARB staff also presented to the quarterly meeting of the Climate Action Team in March 2021, a meeting of the California Environmental Protection Agency Tribal Advisory Committee in July, the California Climate Investments Webinar for Tribal Governments in July, the Partners Advancing Climate Equity cohort of leaders, and have participated in ongoing public engagement efforts hosted by other state agencies to learn more about stakeholder priorities. CARB staff coordinated with a wide range of state agencies to develop this draft, including the California Public Utilities Commission and the many agencies that administer California Climate Investments programs.

CARB will host another public workshop on September 2, 2021. Written public comment on this draft and feedback received at the public workshop will inform development of a Draft Final Investment Plan. The CARB Board will conduct an informational public hearing in Fall 2021 to discuss the Draft Final Fourth Investment Plan. The Department of Finance will issue the Fourth Investment Plan to the Legislature in January 2022.

¹⁶ The presentation slides and a recording of the workshop are available at:
<https://ww2.arb.ca.gov/resources/documents/california-climate-investments-investment-plan>.

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California's Climate Goals and Investment Needs

California has a set of ambitious, science-based targets to reduce GHG emissions and achieve carbon neutrality, summarized in Table 2. State agencies work together with internal and external stakeholders to develop, implement, and enforce a suite of climate policies to achieve these targets. California has already made tremendous progress in reducing emissions, achieving its 2020 GHG emissions reduction target ahead of schedule.¹⁷ However, reaching the 2030 target will require significant, accelerated reductions from every sector. Achieving carbon neutrality will require further reductions and techniques to permanently remove residual GHG emissions from the atmosphere. Many climate mitigation and resiliency strategies are deeply interconnected to other state policy priorities, including providing safe and affordable housing for all Californians, promoting a just transition to a carbon-neutral future, advancing environmental justice, improving public health, and building an equitable and prosperous economy. Effectively addressing climate change necessitates addressing multiple objectives simultaneously.

Table 2. Summary of Key State Climate Goals and Targets

Sector	Key Climate Goals and Targets
Economy-Wide	<ul style="list-style-type: none">• Reduce GHG emissions to:<ul style="list-style-type: none">• 1990 levels by 2020.¹⁸• 40 percent below 1990 levels by 2030.¹⁹• 80 percent below 1990 levels by 2050.²⁰• Achieve a carbon-neutral economy by mid-century.²¹
Sustainable Transportation and Communities	<ul style="list-style-type: none">• Reduce per capita GHG emissions from passenger vehicles to achieve CARB-established targets by 2020 and 2035.²²• Deploy at least 1.5 million zero-emission vehicles (ZEVs) on the road by 2025 and 5 million by 2030.²³• Transition 100 percent of new sales of passenger vehicles and trucks to zero emission and 100 percent of drayage trucks by 2035.²⁴• Transition 100 percent of operating off-road vehicles and equipment to zero emissions everywhere feasible by 2035.²⁴• Transition 100 percent of operating medium- and heavy-duty trucks and buses to zero emissions by 2045 everywhere feasible.²⁴

¹⁷ CARB. *California Greenhouse Gas Trends for 2000 to 2019*. <https://ww2.arb.ca.gov/ghg-inventory-data>.

¹⁸ AB 32 (Nunez, Chapter 488, Statutes of 2006).

¹⁹ SB 32 (Pavley, Chapter 249, Statutes of 2016).

²⁰ EO S-3-05.

²¹ EO B-55-18.

²² SB 375 (Steinberg, Chapter 728, Statutes of 2008). Regional targets available at: <https://ww2.arb.ca.gov/our-work/programs/sustainable-communities-program/regional-plan-targets>.

²³ EO B-48-18.

²⁴ EO N-79-20.

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Sector	Key Climate Goals and Targets
Low-Carbon Energy and Buildings	<ul style="list-style-type: none"> • Double statewide energy efficiency savings from electricity and natural gas end uses by 2030.²⁵ • Supply 60 percent of retail sales of electricity with renewable energy resources by 2031.²⁶ • Supply 100 percent of retail sales of electricity with renewable and zero-carbon resources by 2045.²⁶
Natural and Working Lands	<ul style="list-style-type: none"> • Treat one million acres of forest and wildlands annually by 2025.²⁷ • Conserve at least 30 percent of California's land and coastal waters by 2030.²⁸ • Increase the acreage of coastal wetlands 20 percent by 2030 and 50 percent by 2040.²⁹
Short-Lived Climate Pollutants and Waste Diversion	<ul style="list-style-type: none"> • Reduce the level of statewide disposal of organic waste relative to the 2014 level by 50 percent by 2020 and 75 percent by 2025.³⁰ • Rescue at least 20 percent of currently disposed surplus food for people to eat by 2025.³⁰ • Reduce emissions of methane and hydrofluorocarbon gases to 40 percent below 2013 levels by 2030.³⁰ • Reduce emissions of anthropogenic black carbon to 50 percent below 2013 levels by 2030.³⁰

Sector-Specific Investment Needs

California state agencies are engaged in a variety of processes to plan and implement strategies to support the state's climate goals, with public investments playing a key role. This section compiles investment needs to support state goals as identified in a variety of state agency and external documents. These investment needs are organized by sector, but many emissions sources and investment needs are cross-sectoral. Table 4 in Appendix A includes an overview of key documents that informed these summaries.

These investment needs are high-level and not prioritized here. Specific technologies or approaches may be more responsive to these generalized investment needs than others, and not all investment types that support these needs are appropriate for funding from the GGRF.

²⁵ SB 350 (De León, Chapter 547, Statutes of 2015).

²⁶ SB 100 (De León, Chapter 312, Statutes of 2018).

²⁷ *Agreement for Shared Stewardship of California's Forest and Rangelands Between the State of California and the USDA, Forest Service Pacific Southwest Region.* <https://www.gov.ca.gov/wp-content/uploads/2020/08/8.12.20-CA-Shared-Stewardship-MOU.pdf>.

²⁸ EO N-82-20.

²⁹ *Ocean Protection Council Strategic Plan to Protect California's Coast and Ocean: 2020 – 2025.* http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20200226/OPC-2020-2025-Strategic-Plan-FINAL-20200228.pdf.

³⁰ SB 1383 (Lara, Chapter 395, Statutes of 2016).

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Sustainable Transportation and Communities

Transportation, including on- and off-road vehicles and equipment, accounts for more of the state's GHG emissions than any other sector³¹ and is the primary contributor to poor air quality for millions of Californians.³² Transportation electrification, with affordable options for all Californians, is a core strategy in this sector. However, even with accelerated implementation of zero-emission vehicles, equipment, and the associated infrastructure, Californians across the state will need to drive less in order to meet statewide and regional emissions reduction goals.³³ Achieving this vision requires climate-conscious planning that considers existing disparities, responds to community needs, and integrates land use, transportation, and housing to deliver healthy, affordable, safe, resilient, and equitable communities.

Investments are needed to support:

- Development and deployment of zero-emission vehicles, equipment, and associated infrastructure, covering the technology commercialization spectrum from research and demonstration to deployment and the wide range of vehicle and equipment categories operating in California.
- Transportation options that improve affordability and access to key destinations and reduce vehicle miles traveled (VMT), including public transit, shared mobility, land conservation, active transportation (including both shared and personally owned rideables like electric bicycles), and related infrastructure.
- Diverse types of infill housing development in locations that improve access to and use of low-carbon transportation options, reducing VMT.
- Community transportation needs assessments and regional and local planning for actions that help re-envision the built environment in ways that support sustainable communities and reduce VMT.

Low-Carbon Energy, Buildings, and Industry

Renewable, affordable, and climate-resilient energy systems are fundamental to a prosperous future in California. Increasing energy efficiency to reduce the need for energy generation, transitioning away from natural gas, and rapidly scaling up renewable energy and energy storage are core strategies. Transportation and building electrification, powered by renewable energy, are particularly crucial elements to deliver on near- and long-term climate and air quality goals. Grid resiliency, energy costs, and broader market barriers like contractor experience are important issues that the state must consider as it accelerates progress in these areas.

Another source of building emissions are high global warming potential (GWP) hydrofluorocarbon (HFC) gases, used in refrigeration and air conditioning. HFCs are

³¹ CARB. *California Greenhouse Gas Trends for 2000 to 2019*. <https://ww2.arb.ca.gov/ghg-inventory-data>.

³² CARB. *2020 Mobile Source Strategy – Revised Draft*. https://ww2.arb.ca.gov/sites/default/files/2021-04/Revised_Draft_2020_Mobile_Source_Strategy.pdf.

³³ CARB. *2018 Progress Report: California's Sustainable Communities and Climate Protection Act*. <https://ww2.arb.ca.gov/resources/documents/tracking-progress>.

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short-lived climate pollutants (SLCP) that have a particularly strong impact on climate. California will need to address HFCs to achieve carbon neutrality, even with a complete transition away from combustion of fossil fuels.³⁴ As regulatory requirements phase out the use of HFCs in new systems and provide moderate emissions reductions through refrigerant retrofits of existing refrigeration systems, conversions of existing refrigeration systems to even lower-GWP technologies – particularly refrigeration for food retail – present an opportunity to achieve significant near-term GHG reductions. With rising temperatures, there are further opportunities to reduce GHG emissions from residential air conditioning by providing low-GWP air conditioning systems. Additionally, through expanded building electrification efforts, the state anticipates an increase in the use of heat pump technologies, which commonly use HFC refrigerants. Incorporating heat pump technologies that use refrigerants with the lowest GWP available can help avoid an increase in HFC emissions and support broader carbon neutrality goals.

For the industrial sector, increased energy efficiency, electrification, and renewable energy will help reduce emissions and can support resiliency to climate impacts. However, some energy-intense sectors may be difficult to electrify or have process emissions that are not linked to energy consumption. Additional approaches like low-carbon fuels and carbon capture and sequestration will be needed to reduce industrial emissions.

Investments are needed to support:

- Building decarbonization, including:
 - Electrification for new and existing buildings, paired with energy panel upgrades as needed.
 - HFC reductions through:
 - Refrigeration system conversions for both large supermarkets and smaller, neighborhood grocers.
 - Low-GWP residential air conditioning systems for priority populations, particularly for communities that experience extreme heat.
 - Research, development, and demonstration of low- and ultra-low-GWP technologies for heat pumps used for space conditioning, water heating, and other applications in both the residential and nonresidential sectors.
 - Innovative strategies to reduce emissions from building construction and materials, such as:
 - Low-carbon alternatives for cement and other energy-intensive materials, such as California-sourced mass timber construction materials.
 - Factory-built, prefabricated housing.
- Energy efficiency (including building envelope), renewable energy, and energy storage for residential, commercial, and industrial sectors.
- Carbon capture and sequestration and low-carbon fuel (e.g., renewable natural gas (RNG) or hydrogen from low-carbon sources) for industrial applications.
- Woodstove replacements for home heating to reduce black carbon emissions.

³⁴ Energy and Environmental Economics. *Achieving Carbon Neutrality in California*.
https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf.

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Natural and Working Lands

California's eight natural and working landscapes – including forests, shrublands and chaparral, wetlands, croplands, grasslands, developed lands, sparsely vegetated lands, and seagrasses and seaweeds – provide life-sustaining resources including clean air, water, and food. While natural and working lands have the potential to sequester carbon, they can also be a source of GHG emissions, particularly from carbon loss associated with wildfires and degradation of wetlands. Conversion of natural and working lands to housing and other urban uses can also contribute to higher GHG emissions from transportation and loss of stored carbon during development. Implementing a wide range of climate smart land management strategies is essential for achieving carbon neutrality, increasing resiliency to climate impacts, sustaining biodiversity, and advancing climate mitigation goals in other sectors by: producing low-carbon substitutes for fuels, building materials, and other high-value products; reducing building energy use and costs; promoting active transportation; reducing water treatment and pumping energy needs by improving water quality and storage; and others.

Investments are needed to support:

- Priority nature-based solutions identified in the forthcoming California's "Natural and Working Lands Climate Smart Strategy" that support:
 - Avoided conversion of shrublands and chaparral, croplands, and other landscapes.
 - Increased natural vegetation in cities and communities.
 - Climate-smart agricultural practices.
 - Climate-smart forest management, including building forest health and reducing excess fuels that contribute to high-severity wildfire.
 - Climate smart management of wetlands and riparian areas.

Livestock

Methane is a powerful SLCP. Methane emissions from livestock manure management and enteric fermentation account for approximately half of the methane generated in California and over five percent of total statewide GHG emissions.³⁵ Strategies to reduce these emissions are particularly important to the state's near-term climate goals and can produce low-carbon substitutes for fossil fuel natural gas. The state must consider approaches to minimize air pollution or other local impacts associated with these operations and emissions reduction strategies.

Investments are needed to support:

- Manure management.
- Emerging technologies to reduce enteric fermentation emissions.

³⁵ California Air Resources Board. *California Greenhouse Gas Trends for 2000 to 2019*.
<https://ww2.arb.ca.gov/ghg-inventory-data>.

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Waste Diversion

Organic waste in landfills accounts for 21 percent of the methane generated in California.³⁶ Reducing waste sent to landfills through reduced waste generation, increased recycling and composting, and food recovery is an important component of achieving state climate goals. Supporting a circular economy that turns waste into valuable, reusable products can foster economic development and drive progress towards numerous environmental goals. Projects to divert organic waste from landfills can reduce methane emissions and create beneficial products like compost and low-carbon alternatives to fossil fuels. Food rescue projects can increase food access by rescuing food that would otherwise be landfilled and redirecting that food to help people in need. As the state pursues its waste diversion goals, source reduction and new infrastructure to accommodate increased volumes of diverted organic waste will both play key roles.

Investments are needed to support:

- Organics processing infrastructure, including compost facilities and anaerobic digestion of municipal waste.
- Food waste prevention and rescue.
- Recycling infrastructure.

Water

Access to safe, affordable water is a fundamental human right, and the state has ongoing efforts to ensure reliable access to clean water. The principal source of GHG emissions from the water sector comes from the energy consumed for end uses, as well as to pump, convey, treat, and deliver water. Emissions reduction strategies are therefore primarily associated with reducing the energy intensity of the water sector. While the state does not have water-specific GHG-reduction goals, water-related investments can support emissions reductions, including energy efficiency improvements from water end uses.

Investments are needed to support:

- Energy efficiency for agricultural irrigation.
- Energy-saving water-consuming appliances in residential, commercial, and industrial buildings.

Supporting and Cross-Sectoral Investment Needs

In addition to the sector-specific investments needed for technologies and practices to reduce emissions, there are equally important investment needs to support the transition to a low-carbon future in a way that empowers communities to participate in and lead climate action, creates robust local and regional infrastructure for project planning and implementation, builds a strong workforce with high-quality jobs that supports a just economic transition, and provides for ongoing program adjustments to drive continued progress.

³⁶ California Air Resources Board. *California Greenhouse Gas Trends for 2000 to 2019*.
<https://ww2.arb.ca.gov/ghg-inventory-data>.

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Stakeholder Engagement, Community Capacity, and Diverse Partnerships

Involving people in the design and implementation of programs that affect their lives is a core good governance principle. California Climate Investments emphasizes the importance of robust public processes and transparency to support broad-based stakeholder participation and ensure that programs are responsive to local needs and can be as effective as possible in meeting state goals.

For truly transformative climate action, communities – including residents, community-based organizations, local governments, and others – need resources to actively participate in and lead the planning, selection, design, implementation, and evaluation of programs and projects. Furthermore, development and implementation of projects, particularly more complex projects, often requires a diverse coalition of participants, including community residents and organizations, local and regional agencies, local businesses, and many other others. In addition to facilitating successful project implementation, these diverse partnerships can foster long-term progress by creating sustainable structures for future project development.

Resources specifically focused on stakeholder and community engagement, community leadership, and sustaining meaningful partnerships – like funding for community-focused outreach, capacity building, and technical assistance – can help ensure equitable and sustainable implementation of climate efforts.

High-Quality Jobs and High Road Workforce Development

Achieving a carbon-neutral future will lead to economic changes that will have significant impacts on the employment landscape in California. Assembly Bill (AB) 398 (E. Garcia, Chapter 135, Statutes of 2017) directed the California Workforce Development Board to present a report to the Legislature on strategies “to help industry, workers, and communities transition to economic and labor-market changes related to statewide greenhouse gas emissions reduction goals.” Released in September 2020, the report, *Putting California on the High Road: A Jobs & Climate Action Plan for 2030*, presents a vision for integrating economic and workforce development into climate programs, with sector-specific recommendations.³⁷ The report highlights several key areas for state intervention, including: labor market demand-side strategies (e.g., wage standards and targeted hiring goals) to ensure job quality and job access; labor market supply-side strategies to improve equity and access through best practices for workforce development programs (e.g., creating pre-apprenticeship programs, developing industry sector-based worker-focused training partnerships, integrating supportive services into training program design); and strategies to support a just transition for displaced workers and communities in specific industries or regions.

The recommendations in the report articulate clear opportunities for state climate funding to advance high-quality job creation and high road workforce development. The state could prioritize investments in sectors with strong employment outcomes, leverage its spending

³⁷ The report is available at: <https://laborcenter.berkeley.edu/putting-california-on-the-high-road-a-jobs-and-climate-action-plan-for-2030/>.

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power to create and support high-quality jobs, and provide dedicated resources for high road workforce development to establish pipelines that connect those most in need with high-quality employment opportunities. Example activities could include incorporating job-quality standards into program solicitations or scoring criteria, directly funding high road workforce development programs for a wide range of investment types, or supporting regional partnerships between business, labor, community, local government, education, and other constituencies to address just transition needs and opportunities.

Building on the AB 398 report, the Governor's Office of Planning and Research and the California Labor and Workforce Development Agency's forthcoming "Just Transition Roadmap," pursuant to N-79-20, will provide a framework for California's economic recovery that recognizes global and statewide shifts in key industries and regional economies likely to result from a transition to carbon neutrality. Incorporating strategies from the "Just Transition Roadmap," particularly strategies for high-quality job creation and high road workforce development, into climate incentive programs presents another key opportunity to foster a sustainable and equitable economic future.

Research, Planning, and Evaluation

Successful achievement of state climate goals requires a continuous review of the most effective mitigation and resiliency approaches and how to implement them. Research, including collaborative, participatory research with community stakeholders, can support this process by driving better understanding of climate strategies and policies as well as providing direction to the state, industry, and communities on where new action is needed.

Funding for planning activities by regional and local governments and communities is another important piece of the puzzle, including planning for needs assessments and identification of specific strategies. Planning activities support goal setting, partnership development, and creation of clear implementation road maps that can help ensure projects are as beneficial and inclusive as possible and respond to community priorities.

Finally, evaluation ensures a continuous feedback process that allows governments and stakeholders to understand the impacts of their actions, including for priority populations, and collectively course correct as needed. It can also help to ensure that state programs are meeting their goals and to course correct as needed. Investment in each of these areas can improve effectiveness of program design and project implementation across the state's climate portfolio.

Guiding Principles for Prioritizing Investments

The goal of the Fourth Investment Plan is to identify investment priorities that achieve a variety of policy objectives simultaneously and contribute towards an integrated set of environmental, economic, and social goals. The Plan proposes the following guiding principles, based on existing statutory requirements for the GGRF and input from stakeholders, to provide high-level criteria for prioritizing investments and identifying opportunities to maximize benefits. These guiding principles are interconnected and should be considered collectively.

Support Implementation of State Climate Goals

Incentive programs provide an opportunity to support implementation of state climate goals by developing new technologies, accelerating deployment of clean technologies and practices, reducing barriers to adoption, and delivering near-term emissions reductions. The state should direct public funding where investments can most effectively contribute towards the climate goals and investment needs as identified in the previous section of the Plan, including contributions towards economy-wide GHG reductions, carbon neutrality, and sector-specific targets. State agencies are involved in numerous planning efforts to identify investment needs, and Appendix A identifies the core documents that inform the Plan. As the state works towards these goals, it must simultaneously address changes in employment opportunities to ensure that workers in sectors that must transition away from fossil fuel use have access to high-quality jobs.

Advance Equity and Environmental Justice

Priority populations and other vulnerable communities experience heightened risk and increased sensitivity to climate change and have less capacity and fewer resources to cope with, adapt to, or recover from climate impacts. These disproportionate effects are caused by historical government practices and physical (built and environmental), social, political, and/or economic factor(s), which are exacerbated by climate impacts. These factors include, but are not limited to, race, class, mobility, environmental hazards, pollution exposure, income inequality, neighborhood quality, housing security, and historical exclusion in the decision-making process. The state is actively working to address a legacy of unjust government practices, racism, discrimination, and systemic injustices placing disproportionate burdens on many Californians, especially communities of color and California Native American tribes.

Advancing equity is a central principle in the state's climate portfolio, and there are many different facets that need to be considered. Environmental justice is critical for climate incentive programs. Integrating environmental justice processes and principles throughout programs, focusing investments in areas with disproportionate exposure to pollution, and fostering community leadership can help address historic injustices. Advancing equity also requires addressing additional – and often interconnected – disparities based on race, gender identity, age, disability, socioeconomic status, and many other factors, which may vary depending on the specific community and project focus. It is important for programs to understand the potential environmental justice and equity issues that their processes, projects, and evaluations should consider upfront.

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Deliberately directing resources towards priority populations and other historically marginalized communities is one mechanism to work towards a more equitable future.³⁸ Climate incentive programs present an opportunity to work directly with communities to design and develop projects that can provide tangible benefits that address disparities and result in more equitable environmental, economic, and social outcomes.

Improve Public Health

Public health challenges are complex and influenced by a variety of factors. Many sources of GHG emissions in California also contribute to poor public health, particularly in communities with disproportionate pollution burdens. Air pollution from the production and use of fossil fuels contributes to high rates of asthma, cardiovascular disease, and other public health effects. High VMT caused by urban sprawl and dependence on passenger vehicles for transportation increases obesity, traffic fatalities, and mental health challenges. Impacts from climate change like extreme heat, wildfire smoke, and drought-related water scarcity further contribute to negative public health outcomes. Beyond climate-related public health impacts, social determinants of health – like poverty, lack of housing, unemployment, and structural racism – contribute to poor physical and mental health outcomes. Across the board, climate impacts and other public health stressors are more likely to affect low-income communities and communities of color.

Many climate mitigation and resiliency strategies directly provide important public health co-benefits. Prioritizing climate projects that are focused specifically on improving public health, maximizing health and economic co-benefits associated with investments, and aligning investments where they will be most beneficial based on community public health vulnerabilities will be key in improving public health and addressing health disparities.

Support a Climate-Resilient and Prosperous Economic Future

Climate projects have the potential to provide a variety of economic benefits and leverage private sector investment. Deploying climate funds strategically, particularly in the context of economic recovery from the COVID-19 pandemic, can support broader state economic goals while ensuring that new projects are designed in ways that increase community resiliency to the worsening impacts of climate change. There are many mechanisms to build a climate-resilient, prosperous economic future. For example, focused investments can support a just transition to a carbon-neutral future for the economic sectors that must transition away from fossil fuels and for the communities that rely on fossil fuels for economic activity and revenue. In addition, helping reduce energy and transportation costs, structuring investments in ways that create or support high-quality jobs, investing in high road workforce development to create accessible employment pathways, building resiliency to climate impacts, and leveraging private sector capital can help build a more sustainable, healthy, and equitable California.

³⁸ Throughout the Plan, the term “priority populations” refers to disadvantaged communities and low-income communities and households as defined under SB 535 and AB 1550. Other terms such as “historically marginalized” or “underserved” communities do not have specific definitions in the context of the Plan, although there may be areas in statute where they are defined for certain programs.

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Foster Interagency Coordination

In addition to prioritizing individual investment opportunities to achieve the guiding principles, there are opportunities for the climate portfolio as a whole to maximize benefits through enhanced interagency coordination and consideration of complementary programs. With over 20 state agencies implementing California Climate Investment programs, in addition to numerous additional state and federal environmental incentive programs beyond California Climate Investments, improved interagency coordination can help streamline application processes and project development and identify opportunities to integrate multi-sectoral strategies into projects to deliver on multiple state goals simultaneously.

In addition to identifying these coordination opportunities, it is important to consider how the GGRF fits in to the broader portfolio of climate incentive funding. Given that the GGRF is a limited source of climate incentive funding, programs funded by other funding sources can complement GGRF investments to advance related state goals.

Process for Developing Recommendations

One of the key goals of the Plan is to identify priority investments for funding consideration. The previous chapter identified key investment needs that are consistent with the state's climate goals. In some cases, a variety of different technologies or approaches could meet the high-level investment need. To develop recommendations for funding, the Plan:

- Identifies specific investment types consistent with the investment needs, based on implemented California Climate Investments and other investments identified in state planning documents;
- Uses the guiding principles to develop a suite of metrics to evaluate those investment types and provide guidance on how to use the GGRF relative to other state climate goals; and
- Assesses each investment type using that suite of metrics to identify priority investment types and funding recommendations to advance the guiding principles and maximize benefits.

In determining which investment types to analyze, the Plan identifies the California Climate Investments projects that align with the identified investment needs based on state plans identified in Appendix A and supplementing where needed to capture additional investment types that California Climate Investments has not funded. The Plan only considers those investment types that are consistent with the identified investment needs, and therefore does not consider all of the individual projects that have been implemented under California Climate Investments.

The evaluative metrics, described in Table 3 are designed to help analyze how responsive any given investment type may be to the guiding principles. Not all metrics apply to all investment types, and it is important to consider any given investment type across multiple metrics. Furthermore, the list of metrics is designed to assess key project-level information for the Legislature to consider but does not capture the full range of potential benefits. To the extent feasible, investments should seek to achieve as many of these and other potential benefits as possible.

To analyze investments, the Plan relies primarily on information associated with the implementation of existing California Climate Investments programs. California Climate Investments has funded thousands of projects in areas that are consistent with the identified investment needs, such as affordable housing, renewable energy and energy efficiency, transit and shared mobility, zero-emission vehicles, urban greening, forest and watershed restoration, recycling and food rescue, and many others.³⁹ Each of these investment types can produce a variety of benefits. Agencies administering California Climate Investments estimate GHG emissions reductions and numerous co-benefits from project implementation, such as air pollutant emissions reductions, VMT reductions, energy and travel cost-savings, number of trees planted, and more, and report publicly on project implementation. Twice a year, California Climate Investments publishes a spreadsheet that contains all the reported

³⁹An annual report summarizing project outcomes and the downloadable spreadsheet with detailed information on project implementation are available at: <http://www.caclimateinvestments.ca.gov/annual-report>.

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data. The Plan analyzes each investment type using reported data on California Climate Investments implemented as of November 30, 2020 where available, supplementing with additional information from stakeholders and external research where needed.⁴⁰

Appendix B discusses the analytical results for each individual investment type, and Table 5 includes a summary that distills the results and enables comparison across investment types for each metric. To develop recommendations for funding, the Plan uses the results of the analysis to identify the investment types that could provide benefits across multiple metrics and weighed potential tradeoffs. For example, in some cases, the analysis concluded that certain investment types may not be highly GHG cost-effective but could deliver important public health and equity benefits. The recommendations also considered opportunities to better achieve the metrics within a given investment type through prioritizing certain sectors, populations, or other characteristics. The Plan finds that most investment types were responsive across multiple metrics and recommends funding for the majority of the analyzed investment types, with recommendations for prioritization within those investment types and opportunities for coordination. However, the Plan concludes that a limited number of investment types did not produce significant benefits across enough metrics to recommend as a funding priority.

The analysis and recommendations in the Plan highlight important opportunities but should not be interpreted as exhaustive or comprehensive. The guiding principles and metrics can be applied to additional technologies or practices that the Legislature may wish to consider for California Climate Investments or other incentive programs.

⁴⁰ California Climate Investments works to update quantification methodologies and other benefits assessments on a regular basis. Current methodologies may not capture all benefits and considerations for all project types. As these methodologies improve over time, the estimated benefits may change.

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Table 3. Evaluative Metrics to Develop Funding Recommendations.

Metric	Description
Support implementation of state climate goals	
Accelerate the deployment of zero-emission vehicles, equipment, or infrastructure	California is the nationwide leader in transitioning the transportation fleet to zero-emission technology. Investments that support demonstration and deployment of these technologies play a critical role in accelerating this transition and supporting more widespread adoption of zero-emission vehicle and equipment technologies in California and nationwide.
Advance early-stage technology or practices through research, development, and/or demonstration	In addition to incentivizing accelerated deployment of commercially available key technologies and practices, public funding plays an important role in driving the development of early-stage technologies or practices.
Enhance access to key destinations and reduce VMT	Investments that make it easier for people to reach their destinations and provide flexible transportation options that respond to community needs can help ensure that Californians do not need to rely as heavily on cars, reducing VMT and supporting GHG reduction goals.
Reduce energy consumption or provide storage	As the state transitions to a zero-carbon electric grid, building and transportation electrification activities will increase electricity demand while reducing demand for natural gas and liquid fuels. Investments that promote energy efficiency or provide energy storage help enable the transition to a zero-carbon energy system by avoiding over-building energy generation, supporting load shifting, and providing other grid services.
Generate renewable energy	In addition to reducing energy demand, investments that generate renewable energy help ensure that ongoing energy consumption minimizes GHG emissions.
Implement climate smart land management strategies	Investments that implement climate smart land management strategies and nature-based solutions can maintain or increase carbon sequestration, build climate resiliency, and provide additional benefits including food and water security, public health improvements, and economic prosperity.
Reduce waste sent to landfills	Investment types that reduce the amount of organic and other waste sent to landfills can reduce methane emissions and support the development of a circular economy that reaps a variety of benefits from waste products.
Reduce GHG emissions	Reducing GHG emissions is an important goal of climate incentive programs. GHG cost-effectiveness, measured in dollars per ton of carbon dioxide equivalent reduced, is one way to measure GHG reductions and compare climate benefits across investments. While there are important investments that facilitate GHG reductions without directly reducing GHG emissions, analyzing investments based on GHG cost-effectiveness can support overall progress on climate goals and highlight opportunities in other jurisdictions to reduce GHG emissions.

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Metric	Description
Advance equity and environmental justice	
Benefit priority populations and other underserved populations	Providing investments that respond to community needs and deliver direct, meaningful, and assured benefits to priority populations is one of the most important components of California Climate Investments and a key mechanism to advance equity goals. While the priority population definitions ensure that California Climate Investments prioritize communities with disproportionate environmental burdens and low-income communities and households, there are additional populations that may not meet these definitions but still face disparities in access to resources and exposure to climate risk.
Facilitate access to information, community participation and leadership, local and regional partnerships, and shared decision-making	Communities have an important role to play in envisioning and implementing climate projects, programs, and policy changes that improve residents' lives. To do so, residents need resources to participate in and drive decision-making, and under-resourced governments and community-based organizations need the tools and the capacity to access funding.
Improve public health	
Address a social determinant of health	Social determinants of health are the conditions in the environments where people live, work, and play that affect a wide range of health outcomes and risks. Climate programs can address a social determinant of health in a variety of ways, such as providing employment opportunities or access to safe housing and transportation, facilitating community events through development of urban green space, and fostering social cohesion through planning processes and partnerships.
Reduce criteria air pollutant emissions	Investments that reduce criteria air pollutant emissions, like fine particulate matter and oxides of nitrogen, can help improve both outdoor and indoor air quality, reducing a variety of adverse health effects including respiratory and cardiovascular disease and premature death, particularly when targeted in areas with poor air quality.
Reduce diesel particulate matter emissions ⁴¹	Investments that reduce exposure to diesel particulate matter (diesel PM), a toxic air contaminant, can help reduce cancer risk and a variety of adverse health effects including respiratory and cardiovascular disease and premature death, particularly when targeted in areas with poor air quality.

⁴¹ Climate-related projects also have the potential to reduce toxic air contaminants beyond diesel PM. However, California Climate Investments does not currently collect data on these pollutants. For general information on toxic air contaminants visit: <https://ww2.arb.ca.gov/our-work/topics/airborne-toxics>.

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Metric	Description
Increase physical activity or access to outdoor recreation	Physical inactivity contributes to thousands of premature deaths each year and the development and worsening of chronic diseases like heart disease, stroke, cancer, Type 2 diabetes, and obesity. Active transportation and other strategies to increase access to outdoor recreation can increase physical activity, improve mental health, and reduce stress.
Reduce health risk from extreme heat	Investments that reduce exposure to extreme heat can reduce the risk of premature death, cardiovascular stress and failure, and heat-related illnesses such as heat stroke and heat exhaustion.
Increase access to food	Investments that increase access to food, especially nutritious food options, can reduce the effects of food insecurity, which can include poor school attendance and performance, lowered workplace productivity, diet-related diseases, and other physical and mental health problems.
Support a climate-resilient and prosperous economic future	
Provide cost savings to consumers and/or businesses	Investments that save individuals or businesses money from reduced energy, travel, food, or other costs can support economic recovery by reducing economic hardship.
Increase resiliency to climate impacts	Investments that improve resiliency to climate impacts like drought, sea-level rise, and wildfires can help reduce risk and ensure that communities are better positioned to respond to and recover from these events, reducing the economic impacts when these events occur.
Provide employment opportunities	Creating and supporting high-quality jobs is a core economic benefit of California Climate Investments projects, which interact with labor markets by directly employing people for project development, implementation, and maintenance and by funding workforce development programs that increase access to training and employment. Agencies administering California Climate Investments are required to report on investments that directly provide jobs or job training in certain scenarios. Investments that directly provide job present opportunities to advance job quality and job access in associated industry sectors and help inform or shape workforce development opportunities.
Foster interagency coordination	
Highlight opportunities for interagency coordination to achieve multiple benefits ⁴²	Many investment types may present opportunities to implement solutions that can address multiple state goals simultaneously. Identifying these cross-sectoral opportunities and associated funding programs can help maximize the benefits from public spending by advancing multiple state goals simultaneously and streamlining project implementation.
Consider the availability of other funding sources	Given that the GGRF is a limited source of climate incentive funding, programs funded by other funding sources can complement GGRF investments to advance related state goals. The Plan considers the available funding from non-GGRF funding sources in developing recommendations.

⁴² The Plan does not compare investment types across this metric, but instead uses it to identify opportunities within an investment type.

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Recommendations

The following recommendations for funding priorities and metrics present a strategic, targeted approach to advance the guiding principles as effectively as possible.

Recommended Funding Priorities

The Plan analyzes over 30 potential investment types to identify key opportunities for GGRF funding for Fiscal Years 2022-23 through 2024-25, as summarized in Appendix B. There are many investment types that would provide benefits and support California's climate, equity, environmental, and economic goals. Current law includes several important funding priorities for the GGRF, most recently the set of priorities identified in AB 398. In response to these priorities, the state has expanded its funding portfolio to include a broader set of investment types that covers multiple sectors, more funding for job training and workforce development, and support for community-focused programs with capacity building, technical assistance, and flexible funding.

The funding recommendations included below are largely consistent with these recent developments but provide additional focus areas for consideration, identify emerging opportunities, and highlight opportunities to improve interagency coordination and community involvement to maximize benefits. Given the limited amount of GGRF funding available, the proposed annual budgets for FY 2022-23 through 2024-25 may not necessarily include all of these investment opportunities.

1. Fund investments in key sectors that support GGRF statutory priorities and drive progress on state climate goals.

Sustainable Transportation and Communities

Investments in sustainable transportation and communities deliver on key state climate goals, provide important public health benefits, and can be targeted to advance equity in priority populations and other underserved communities. Projects in this sector support AB 398 investment priorities including reductions in air toxics and criteria air pollutants from mobile sources and low- and zero-carbon transportation alternatives.

Many state agencies fund related investments in these sectors, presenting opportunities for interagency coordination. Agencies can improve coordination through joint outreach, solicitations, and application review, or other mechanisms. Based on the analysis in Appendix B, the Plan recommends prioritizing GGRF funding for the following investment types through existing programs:

Program Highlight

Access Clean California, funded through California Climate Investments, is a statewide project that connects income-qualified residents with clean energy and transportation benefits, supported by community-based technical assistance and community engagement partnerships to help make sure programs reach priority populations. Expanding tools like these to include more incentive programs will maximize their impact for priority populations.

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- Active transportation investments including community-scale projects aligned with community planning efforts and consumer-focused incentives for rideables (e.g., electric bicycles).
- Affordable, energy-efficient, infill housing development that helps reduce VMT, consistent with existing continuous appropriations, with a focus on all-electric buildings.
- Zero-emission shared mobility options and services aligned with community planning efforts.
- Transit and rail services, including High-Speed Rail, consistent with existing continuous appropriations, with a focus on zero-emission technologies for buses, ferries, passenger locomotives, and supporting infrastructure.
- Zero-emission vehicles and equipment, in coordination with non-GGRF sources of funding, prioritizing:
 - Equity-based light-duty investments.
 - Small medium- and heavy-duty vehicle fleets in communities facing air quality challenges.
 - Off-road incentives, including both freight and non-freight applications in communities facing air quality challenges.
 - Demonstration of zero-emission off-road equipment and vehicles, including but not limited to agricultural and construction equipment, marine vessels, and locomotives.

Program Highlight

The California State Transportation Agency's Transit and Intercity Rail Capital Program is building on its record of expanding transit access to achieve additional benefits by incorporating cutting-edge zero-emission technologies, including the state's first fuel-cell train, and incentivizing transit projects located near housing to support housing and VMT reductions.

Low-Carbon Energy, Buildings, and Industry

Investments in low-carbon energy, buildings, and industry support AB 398 investment priorities including reductions in toxic air contaminants and criteria air pollutants from stationary sources, reducing short-lived climate pollutants, and climate adaptation and resiliency. In many cases, the analysis of investment types in Appendix B identified non-GGRF funding sources for low-carbon energy, buildings, and industry. However, there are important areas where the GGRF can complement other funding sources to drive further progress in this sector. The Plan recommends prioritizing GGRF funding for the following investment types:

Program Highlight

The California Energy Commission's Food Production Investment Program provides for facility-specific projects that integrate multiple technology solutions to reduce GHG emissions from industrial food production facilities, like energy efficiency improvements, renewable energy generation, energy storage, low-GWP refrigerants, and zero-emission equipment.

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- Innovative industrial emissions reduction projects, such as energy efficiency, renewable energy, electrification, and other efforts to replace fossil fuels (e.g., incorporation of RNG or hydrogen from low-carbon sources for sectors that will be difficult to electrify), funded through existing programs and prioritizing projects that maximize local air pollution benefits at facilities that do not receive other state incentives.
- Consumer-focused incentives or financing assistance for building electrification at existing buildings, funded through new or existing programs, depending on the design.
- Consumer incentives and demonstration funding to support advanced back-up power technologies in a variety of applications through new or existing programs, prioritizing zero-emission technologies and low-carbon energy sources where possible.
- Refrigerant emissions reductions, including full refrigeration system conversions in existing stores, focusing on projects that can provide energy savings for small-scale and independent grocers located in priority populations.

Natural and Working Lands

Natural and working lands investments support AB 398 priorities including sustainable agricultural practices, healthy forests and urban greening, reducing short-lived climate pollutants, and climate adaptation and resiliency. Projects in this sector can provide particularly cost-effective GHG reductions and carbon sequestration while delivering a variety of other important benefits including improved air and water quality, ecosystem services, and increased resiliency to climate impacts.

The Plan recommends prioritizing GGRF funding for nature-based solutions to accelerate climate smart management of California's natural and working landscapes, consistent with the forthcoming "California's Natural and Working Lands Climate Smart Strategy," such as support through existing programs for:

- Forest health.
- Sustainable agricultural practices (e.g., soil health practices).
- Urban and community forestry and greening.
- Restoration of wetlands and riparian areas.

Program Highlight

The California Natural Resources Agency's Urban Greening program incorporates active transportation infrastructure to support outdoor recreation and reduce VMT, while providing urban green spaces that reduce extreme heat. In addition to reducing extreme heat, community greening and urban forestry can improve air quality, reduce runoff and soil erosion, improve water storage, provide wildlife habitat and increase biodiversity, reduce building energy use and costs, and provide recreation opportunities and jobs.

Livestock

Investments in livestock support AB 398 priorities including reducing short-lived climate pollutants. Reducing livestock methane is critical to achieve near-term GHG reductions and carbon neutrality. Based on the analysis in Appendix B, the Plan recommends prioritizing GGRF funding for:

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- Alternative manure management to support methane reductions at smaller dairies or at dairies that may not be appropriate for a digester through existing programs.
- Anaerobic digestion of dairy manure projects that consider and work to address overall local impacts including air pollution, water pollution, and odor, with particular emphasis on projects that provide biomethane for difficult-to-decarbonize sectors, funded through existing programs.
- Pilot efforts to reduce livestock enteric fermentation emissions, funded through new or existing programs, depending on the design.

Waste Diversion

Investments in waste diversion support AB 398 priorities including reducing short-lived climate pollutants. Diversion of organic waste provides critical near-term methane emissions reductions, and community-based programs that provide access to food offer opportunities to advance equity and provide public health benefits. In addition, investing in the state's recycling infrastructure to manage a wide range of recovered materials and develop a circular economy can reduce upstream GHG emissions and conserve natural resources. Based on the analysis in Appendix B, the Plan recommends prioritizing GGRF funding through existing programs for:

- Food waste prevention and rescue.
- Compost production, with a portion dedicated to community composting projects.
- Anaerobic digestion of municipal waste projects that minimize local impacts.
- Recycling infrastructure for non-organic waste.

Program Highlight

CalRecycle's Organics Grant program encourages grant applicants to establish Community Benefit Agreements as a component of projects. These agreements between applicants and groups representing local residents near the proposed facility include ongoing communication, actions to reduce facility impacts, monitoring and complaint reporting protocols, and other community benefits. This program element incentivizes applicants to work with communities to develop projects that consider the needs of the community.

2. Provide dedicated funding to advance equity, environmental justice, and community participation.

The suite of climate investment types come together in the communities where Californians live and work. Coordinating these investments in ways that are responsive to local needs requires putting communities in the lead. Providing resources for staff, equipment, and operations can enable community-based organizations and other entities to meaningfully participate in state climate programs and build local partnerships that can sustain progress over time. To support local leadership and decision-making and ensure that climate incentive projects reach priority populations and other underserved communities, the Plan recommends exploring funding through existing programs to support community-based organizations, local and regional governments, and tribal governments for:

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- Capacity building and technical assistance, including technical assistance for program types identified in the Strategic Growth Council (SGC)'s Technical Assistance Guidelines.
- Community-level planning and needs assessments.
- Flexible pots of funding to implement community plans.
- Outreach related to awareness and education.

Many existing California Climate Investments programs are already implementing these kinds of projects, which help increase access to funding, provide opportunities for community participation and leadership, and ensure that project development and implementation are responsive to community needs. In many cases, these activities would benefit from enhanced coordination between agencies, particularly with respect to accessing funding.

Program Highlight

CARB's Clean Mobility Options and Sustainable Transportation Equity Project programs provide technical assistance to help make these programs accessible to all Californians. Application assistance, follow-up conversations with unsuccessful applicants, and office hours before and during grant implementation can help communities overcome barriers to develop and implement successful projects.

Investments in these areas are designed to support community-oriented investments that are directly responsive to local needs. Complementary strategies to support partnership building and enable meaningful community can help these investment types achieve their goals. For example, for programs that involve collaboration with community residents and developing partnership structures, the upfront time required to build critical relationships, conduct stakeholder outreach, develop draft solicitation materials, incorporate public comment, provide technical assistance to potential grantees, and finalize grant agreements can create a time crunch that may favor potential grantees with more resources, more technical capacity, or more existing experience with the program. Building in additional time for program development and implementation can help programs broaden their outreach efforts, collaborate with community-based organizations, and advance equity goals. Another key program design element to support is the ability for state agencies to contract and sub-contract with community partners to enable local, community-specific outreach, program design, and implementation.

In addition to longer planning and implementation timeframes and contracting with community organizations, there are other approaches that can help ensure priority populations and other underserved communities can participate in these programs. For underfunded organizations, low-income households, or low-income individuals, needing to provide funds upfront can create significant financial barriers to program participation. Strategies to reduce

Program Highlight

The Department of Conservation's Regional Forest and Fire Capacity Program provides block grants to regional and statewide entities to conduct a variety of activities related to outreach, planning, and capacity building to support forest health projects, allowing regions to identify and develop projects and activities that are responsive to regional partners' needs.

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this barrier by exploring advance payment where appropriate to help programs reach these important partners and populations. It is also important for state agencies to adopt strategies to enable meeting participation.

State agencies have implemented these strategies to varying degrees. The state can explore expanded opportunities to address existing barriers and incorporate these important practices into a broader set of equity-focused programs.

Program Highlight

CARB's Community Air Grants and Community Air Protection Incentive programs draw on CARB's authority (Health and Safety Code §39603.1) to provide advance payments to grantees under certain conditions established in statute and program guidelines – an approach that safeguards state funds while enabling community-based organizations and smaller air districts to participate in the program and administer important projects to improve community air quality.

3. Direct funding towards high-quality jobs and high road workforce development.

The state has clear priorities to promote high road jobs and a just transition to a carbon-neutral economy, presenting opportunities to proactively advance high-quality job creation and high road workforce development strategies that create pathways for high-quality jobs, increase access to quality training and employment for priority populations, and support low-carbon technologies and sectors. To implement these goals, the Plan recommends advancing programs that:

- Provide funding to existing workforce development programs and support expansion of workforce development efforts into more investment types in coordination with other state and federal workforce dollars, particularly in sectors where there are opportunities to create or support pathways to high road jobs and where sustained job growth is occurring, planned, or expected.
- Incorporate job quality and job access measures (e.g., standards, requirements, and targets) across more investment types, prioritizing investment types that directly support or create jobs.

Program Highlight

The California Workforce Development Board has invested in High Road Training Partnership projects statewide and across the economy that reflect the state's priorities in mitigating and adapting to climate change through technology and innovation and nature-based solutions. These partnerships are the foundation to an industry-based, worker-focused skills building infrastructure that brings together workers, employers, and communities to collaboratively address job quality and access in their industries and build economic, social, and environmental resilience. This program provides a model for "high road" workforce development, creating economic opportunity and mobility for workers

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4. Integrate nature-based solutions and zero-emission technologies into investment types across sectors.

The development of almost any climate mitigation or resiliency project presents opportunities to align with other state goals. The Plan identifies several particularly promising areas for investments to cross-pollinate, most notably through integration of nature-based solutions and zero-emission technologies. To maximize benefits from a broader set of investment types, the Plan recommends state agencies:

- Integrate nature-based climate solutions into community adaptation plans and infrastructure investments, including transportation, housing, and energy infrastructure initiatives where possible. Example opportunities include:
 - planting and maintaining trees and vegetation along roadways, surface parking lots, and along bike and pedestrian paths;
 - “greening” traditionally “grey” infrastructure (e.g., green storm and wastewater management, green flood protection, green roofs); and
 - installing parks, community gardens, or greenways.
- Incorporate zero-emission technologies wherever possible across state investments. Example opportunities include:
 - using zero-emission vehicles, equipment, and infrastructure in transit and waste diversion projects;
 - incorporating renewable energy generation into housing and transit projects;
 - prioritizing electric appliances as part of energy efficiency retrofits;
 - using low- or ultra-low-GWP technologies wherever feasible for projects that involve refrigeration, air conditioning, or heat pump technologies;
 - considering zero-emission infrastructure in local and regional plans; and
 - constructing all-electric affordable housing.

Program Highlight
SGC’s Affordable Housing and Sustainable Communities program requires that all projects must incorporate at least one urban greening feature as part of the application, ensuring that the housing developments provide additional climate and public health benefits.

Program Highlight
The California Coastal Commission’s Coastal Resilience Planning program has worked to incorporate planning components that address ZEV infrastructure to support climate-resilient development of transportation electrification.

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5. Support policy-relevant research and program evaluation tied to emissions-reducing projects.

AB 398 identifies climate and energy research as a funding priority for GGRF. Research and program evaluation are both important components of a holistic climate funding portfolio. Research can provide an array of insights to help individual programs and the state more broadly identify emerging emissions reduction strategies, assess unintended consequences from investments, and estimate additional benefits. Coupling research activities with emissions-reducing projects can ensure that they provide valuable, policy-relevant insight while providing tangible, on-the-ground benefits. Program evaluation is equally important and can help the state understand the specific impacts and effectiveness of individual programs, whether the programs are achieving their goals, whether the intended populations and communities are receiving the intended benefits, and how to adjust programs to ensure the best use of state incentive dollars.

The Plan recommends advancing research and program evaluation activities with the GGRF by:

- Exploring funding for applied policy-relevant research tied to emissions reduction projects and developed collaboratively in coordination with state agencies and stakeholders, including community residents.
- Providing for policy-relevant program evaluation, including data collection for implemented projects, at the project and program level as an eligible component of GGRF appropriations, as appropriate.

Program Highlight

SGC's Climate Change Research program relies on a stakeholder process, external experts, and an interagency panel to develop policy-relevant research plans. The program centralizes a community-focused approach to research by requiring that eligible researchers partner with community-based organizations, tribal governments, local governments, or other partners through subcontracts.

6. Advance support for priority populations and other underserved communities.

Across the broad suite of potential investment types, there are opportunities to advance equity and direct more resources to priority populations and other underserved communities. Establishing targets to drive investment, along with clear policy direction, can help achieve these goals. To help increase resources supporting equity goals, the Plan recommends:

- Exploring opportunities to increase portfolio-wide priority population targets where appropriate.
- Exploring investment minimums, where appropriate, to include additional population segments (e.g., tribal governments, rural areas, socially disadvantaged farmers, climate vulnerable communities) beyond existing priority population definitions for specific programs in limited, context-specific applications.

Program Highlight

The California Department of Food and Agriculture targets a minimum of 25 percent of its technical assistance funds to assisting socially disadvantaged farmers with applications to its suite of GGRF-funded Climate Smart Agriculture programs.

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Recommended Metrics

Agencies administering California Climate Investments programs report extensive information on project implementation and benefits, and the Plan relies heavily on this information to develop recommendations. The identified metrics the Plan uses represent important, foundational data points for understanding benefits from climate strategies.

However, as California continues its efforts to improve racial and social equity, address environmental justice, promote public health and resiliency, and support high-quality jobs and a just transition, there are opportunities to enhance the data that administering agencies collect and report. For example, enhanced data collection on the race, ethnicity, gender identity, or other demographic characteristics of grant recipients and applicants, in addition to ongoing program evaluation, tracking, and community engagement, would enable state agencies to better understand who is benefiting from investments and how funds support equity goals. For example, transit investments may have differential impacts on ridership for people with different gender identities. Understanding these dynamics is an important first step in addressing them, consistent with state and federal law.

Program Highlight

SGC's Transformative Climate Communities program requires that applications include plans to help avoid the displacement of existing households and small businesses. Considering these impacts upfront and identifying specific strategies can help meet equity goals and avoid unintended consequences like displacement from project implementation.

The Plan recommends the following additional metrics for use in state climate incentive programs, as appropriate, to enhance the state's ability to evaluate investments, understand who is benefiting from projects, and improve implementation:

- Public health metrics, including but not limited to those already identified in the Plan, to quantify additional benefits (e.g., health benefits from reduced commute time) and target investments in a manner that maximizes public health benefits.
- Data on race, ethnicity, gender identity, socioeconomic status, and other demographic data of grant applicants and recipients to help agencies better understand and address disparities in their programs, consistent with state and federal law.
- Additional qualitative and quantitative job quality metrics to understand labor market outcomes and successes associated with investments.
- Additional data on public health and climate benefits associated with implementation of nature-based climate solutions.
- Additional equity metrics at the project level to evaluate how programs contribute to equity goals and support identification of unintended consequences (e.g., residential displacement).

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In some cases, tools and data already exist to support use of these expanded metrics and administering agencies could easily incorporate them. For example, programs could incorporate additional health data to help target projects through tools like the California Department of Public Health's Climate Change and Health Vulnerability Indicators for California tool, which identifies climate-related health vulnerabilities for locations throughout the state, or Cal-Adapt, which provides location-specific information on local climate risks and vulnerabilities. Others could require collection of new information from grantees, which may require new tools and must be considered carefully and designed in a way that does not place additional burden on grantees.

Program Highlight

The Department of Forestry and Fire Protection's (CAL FIRE) Forest Health Program has taken proactive steps to integrate workforce development into its core program functions to help build the skilled workforce needed in the forestry sector. CAL FIRE has invested directly in job training programs related to a variety of forestry career pathways, and Forest Health grantees collect and report detailed employment information to support tracking progress on employment outcomes from forestry projects.

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Appendix A: State Documents Identifying Investment Needs

California state agencies are involved in a variety of ongoing planning and research activities to identify strategies to meet state goals. While there are dozens of important state documents that are guiding state climate strategies and investments, the Plan relies in particular on the state-developed, -sponsored, or -approved plans and research summarized in Table 4 to identify critical climate strategies for California and associated investment needs. However, the list of documents included should not be viewed as an exhaustive set of relevant resources.

In addition to these state documents, the Plan recognizes the valuable contributions of external researchers and advocacy organizations to help improve state implementation of climate strategies and referred to many external resources for additional guidance (e.g., the Greenlining Institute’s *Making Equity Real in Climate Adaptation and Community Resiliency Programs: A Guidebook*) beyond those listed in Table 4.

Table 4. State Documents Identifying Climate Strategies and Investment Needs.

Source	Title	Description	Link
California Department of Food and Agriculture	“Farmer- and Rancher-Led Solutions”	The California Department of Food and Agriculture held a series of six public stakeholder meetings in February 2021 to solicit farmer- and rancher-led climate change solutions that sequester carbon, reduce GHGs, ensure climate resilience, provide food security, and increase biodiversity. These meetings were held in accordance with EO N-82-20, which calls for CDFA to work with agricultural stakeholders to identify farmer- and rancher-led solutions.	https://www.cdfa.ca.gov/efi/climate/
California Energy Commission	<i>2019 California Energy Efficiency Action Plan</i>	The <i>2019 California Energy Efficiency Action Plan</i> covers issues, opportunities, and savings estimates pertaining to energy efficiency in California’s buildings, industrial, and agricultural sectors.	https://www.energy.ca.gov/programs-and-topics/programs/energy-efficiency-existing-buildings
California Energy Commission	<i>Electric Vehicle Charging Assessment – AB 2127</i>	AB 2127 (Ting, Chapter 365, Statutes of 2018) requires the California Energy Commission to biennially assess the electric vehicle charging infrastructure needed to meet the state’s goals of putting at least 5 million zero-emission vehicles on California roads by 2030 and reducing greenhouse gas emissions to 40 percent below 1990 levels by 2030.	https://www.energy.ca.gov/programs-and-topics/programs/electric-vehicle-charging-infrastructure-assessment-ab-2127

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Source	Title	Description	Link
California Energy Commission, California Public Utilities Commission, and CARB	<i>2021 SB 100 Joint Agency Report</i>	The <i>2021 SB 100</i> (De León, Chapter 312, Statutes of 2018) <i>Joint Agency Report</i> includes a review of the policy to provide 100 percent of electricity retail sales and state loads from renewable and zero-carbon resources in California by 2045. The report assesses various pathways to achieve the target and an initial assessment of costs and benefits.	https://www.energy.ca.gov/sb100#anchor_report
California Environmental Protection Agency, California Natural Resources Agency, California Department of Food and Agriculture, CARB, and SGC	<i>January 2019 Draft California 2030 Natural and Working Lands Climate Change Implementation Plan</i>	This draft implementation plan is a collaborative effort by the California Natural Resources Agency, California Department of Food and Agriculture, California Environmental Protection Agency, CARB, and SGC. It aims to coordinate all natural and working lands programs under a united approach that will move us toward our combined goal of maintaining a resilient carbon sink and improved air and water quality, water quantity, wildlife habitat, recreation, and other benefits.	https://ww2.arb.ca.gov/resources/documents/nwl-implementation-draft
California Natural Resources Agency	"2021 State Adaptation Strategy" (forthcoming)	The Newsom Administration is updating California's "State Adaptation Strategy" this year. The goal is to deliver a 2021 Strategy that outlines the state's key climate resilience priorities, includes specific and measurable steps, and serves as a framework for action across sectors and regions in California.	https://resources.ca.gov/Initiatives/Building-Climate-Resilience/2021-State-Adaptation-Strategy-Update
California Natural Resources Agency	"Natural and Working Lands: Climate Smart Strategy" (forthcoming)	The California Natural Resources Agency is coordinating the first statewide "Natural and Working Lands Climate Smart Strategy" to drive long-term climate action across key California landscapes. This strategy was called for in EO N-82-20 and is intended to accelerate climate smart land management in the coming years and decades to contribute to achieving carbon neutrality and building climate resilience.	https://resources.ca.gov/Initiatives/Expanding-Nature-Based-Solutions

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Source	Title	Description	Link
California Natural Resources Agency	<i>Safeguarding California Plan: 2018 Update</i>	The Safeguarding California Plan: 2018 Update is the state's roadmap for everything state agencies are doing and will do to protect communities, infrastructure, services, and the natural environment from climate change impacts. This holistic strategy primarily covers state agencies' programmatic and policy responses across different policy areas, but it also discusses the ongoing related work to coordinate local and regional adaptation action and developments in climate impact science.	https://resources.ca.gov/CNRALegacyFiles/docs/climate/safeguarding/update2018/safeguarding-california-plan-2018-update.pdf
California State Transportation Agency	<i>Climate Action Plan for Transportation Infrastructure</i>	On July 12, 2021, the California State Transportation Agency adopted the <i>Climate Action Plan for Transportation Infrastructure</i> . The plan details how the state recommends investing billions of discretionary transportation dollars annually to aggressively combat and adapt to climate change while supporting public health, safety, and equity.	https://calsta.ca.gov/subject-areas/climate-action-plan
California Workforce Development Board	<i>Putting California On the High Road: A Jobs and Climate Action Plan for 2030</i>	Prepared by the University of California Berkeley Center for Labor Research and Education, the report offers California a vision for integrating economic and workforce development into major climate policies and programs in order to help achieve California's major climate goals: achieving 2030 GHG emission reduction targets and transitioning to a carbon neutral economy by 2045.	https://cwdb.ca.gov/wp-content/uploads/sites/43/2020/09/AB-398-Report-Putting-California-on-the-High-Road-ADA-Final.pdf
CalRecycle	<i>Analysis of the Progress Toward the SB 1383 Waste Reduction Goals</i>	SB 1383 (Lara, Chapter 395, Statutes of 2016) requires CalRecycle to conduct an analysis of waste sector, state government, and local government progress toward meeting the 2020 and 2025 organic disposal reduction goals. In consultation with CARB, CalRecycle staff identified and analyzed data and information to gauge the progress that has been made toward achieving the 2020 and 2025 goals.	https://www2.calrecycle.ca.gov/Publications/Details/1693

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Source	Title	Description	Link
CARB	<i>2017 Climate Change Scoping Plan</i>	The <i>2017 Scoping Plan</i> identifies how the state can reach our 2030 climate target to reduce GHG emissions by 40 percent from 1990 levels, and substantially advance toward our 2050 climate goal to reduce GHG emissions by 80 percent below 1990 levels.	https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf
CARB	<i>2018 Progress Report: California's Sustainable Communities and Climate Protection Act</i>	Senate Bill (SB) 150 (Allen, Chapter 646, Statutes of 2017) requires CARB to prepare a report to the Legislature starting in 2018, and every four years thereafter, to discuss progress related to the Sustainable Communities Act, or SB 375, implementation. This progress report uses data-supported metrics to assess progress on transportation, housing, and land use strategies, identifies best practices and challenges to achieving greater reductions, and discusses the impact of state policies and funding.	https://ww2.arb.ca.gov/resources/documents/tracking-progress
CARB	<i>2020 Mobile Source Strategy – Revised Draft</i>	CARB staff is developing the <i>2020 Mobile Source Strategy</i> to take an integrated planning approach to identify the level of transition to cleaner mobile source technologies needed to achieve all of California's emissions reduction targets. The actions contained in the <i>2020 Mobile Source Strategy</i> will deliver broad environmental and public health benefits, as well as support much needed efforts to modernize and upgrade transportation infrastructure, enhance system-wide efficiency and mobility options, and promote clean economic growth in the mobile sector.	https://ww2.arb.ca.gov/sites/default/files/2021-04/Revised_Draft_2020_Mobile_Source_Strategy.pdf

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Source	Title	Description	Link
CARB	<i>Analysis of Progress toward Achieving the 2030 Dairy and Livestock Sector Methane Emissions Target (Draft)</i>	SB 1383 establishes a methane emissions target for the dairy and livestock sector and requires CARB to conduct an analysis on progress the sector has made in achieving the target. The <i>Draft Analysis of Progress toward Achieving the 2030 Dairy and Livestock Sector Methane Emissions Target</i> describes progress the dairy and livestock sector has made toward achieving the 2030 target and describes progress made on overcoming technical and market barriers to dairy and livestock methane emissions reduction projects.	https://ww2.arb.ca.gov/resources/documents/draft-2030-d-l-ch4-analysis
CARB	<i>Low-Income Barriers Study, Part B: Overcoming Barriers to Clean Transportation Access for Low-Income Residents</i>	Pursuant to the Clean Energy and Pollution Reduction Act of 2015, SB 350 (De León, Chapter 547, Statutes of 2015), the document presents its findings on the barriers low-income residents, including those in disadvantaged communities, face to access zero-emission and near zero-emission transportation and mobility options, and recommendations to increase access. Recommendations establish a pathway to overcome these barriers statewide.	https://ww2.arb.ca.gov/resources/documents/carb-barriers-report-final-guidance-document
CARB	<i>Short-Lived Climate Pollutant Reduction Strategy</i>	The <i>SLCP Reduction Strategy</i> is California's plan for reducing emissions of high global-warming potential gases with short atmospheric lifetimes. SLCPs include the greenhouse gases methane, HFCs and anthropogenic black carbon.	https://ww2.arb.ca.gov/resources/documents/slcp-strategy-final

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Communities selected by CARB under the Community Air Protection Program	"Community Emissions Reduction Programs"	As part of the Community Air Protection Program developed pursuant to AB 617 (C. Garcia, Chapter 136, Statutes of 2017), CARB has selected communities to develop community emissions reduction programs to improve air quality in their community. Air districts partner with local communities to form community steering committees and develop these plans, which are submitted to air district boards for adoption and the CARB Board for approval. CARB has approved a suite of community emissions reduction programs, which identify a range of strategies to improve air quality that reflect community priorities and provide an important resource for state agencies to understand and reflect community needs in their programs.	https://ww2.arb.ca.gov/capp-communities
Energy and Environmental Economics	<i>Achieving Carbon Neutrality in California: PATHWAYS Scenarios Developed for CARB</i>	This study evaluates scenarios that achieve carbon neutrality in California by 2045.	https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct_2020_0.pdf
Forest Climate Action Team	<i>California Forest Climate Plan: Managing Our Forest Landscapes in a Changing Climate</i>	Developed by an interagency team, the <i>Forest Carbon Plan</i> considers opportunities to reverse recent significant impacts associated with climate change and firmly establish California's forests as a more resilient and reliable long-term carbon sink, rather than a GHG and black carbon emission source.	https://resources.ca.gov/CNRALegacyFiles/wp-content/uploads/2018/05/California-Forest-Carbon-Plan-Final-Draft-for-Public-Release-May-2018.pdf
Governor's Forest Management Taskforce	<i>California Wildfire and Forest Resilience Action Plan</i>	A comprehensive action plan to reduce wildfire risk for vulnerable communities, improve the health of forests and wildlands, and accelerate action to combat climate change. The Task Force and the state's efforts going forward will be guided by this <i>Action Plan</i> with an overall goal to increase the pace and scale of forest management and wildfire resilience efforts by 2025 and beyond.	https://fmtf.fire.ca.gov/media/cjwfpckz/californiawildfireandforestresilienceactionplan.pdf

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Source	Title	Description	Link
Governor's Office of Business and Economic Development	<i>California Zero-Emission Vehicle Market Development Strategy</i>	The <i>ZEV Market Development Strategy</i> is meant to help California collectively move forward and deliver zero-emission benefits to all Californians. It outlines how state agencies and stakeholder groups key to our transition can move together with the scale and speed required to reach the state's ZEV targets.	https://static.business.ca.gov/wp-content/uploads/2021/02/ZEV_Strategy_Feb2021.pdf
Governor's Office of Planning and Research and California Labor and Workforce Development Agency	"Just Transition Roadmap" (<i>forthcoming</i>)	The "Just Transition Roadmap" will provide a framework for ensuring a high road transition to carbon neutrality in California that recognizes the diversity of the state's regions, emphasizes the need for and value of strategic partnerships, and advances the high road principles of equity, job quality, and environmental sustainability and climate resilience.	https://opr.ca.gov/economic-development/
Health in All Policies Task Force	<i>Equity in Government Practices Action Plan</i>	The <i>Equity in Government Practices Action Plan</i> seeks to advance social, health, and racial equity by following a three-part strategy of normalizing conversations about equity, organizing government to achieve equity, and operationalizing practices and policies to promote equity.	https://sgc.ca.gov/programs/hiap/docs/20180201-HiAP_Equity in Government Practices Action Plan_2018-2020.pdf
California Ocean Protection Council	<i>Strategic Plan to Protect California's Coast and Ocean: 2020-2025</i>	The <i>Strategic Plan to Protect California's Coast and Ocean: 2020-2025</i> envisions all California communities enjoying thriving ecosystems, clean water, healthy food, secure infrastructure, ready public access to the coast and ocean, and an inclusive blue economy that advances ecosystem health, offers meaningful work, and reverses past injustices. The California Ocean Protection Council (OPC) developed this strategic plan to advance focused, high-value interagency collaboration that is needed to meet these goals and achieve our collective vision.	http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20200226/OPC-2020-2025-Strategic-Plan-FINAL-20200228.pdf

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Source	Title	Description	Link
SGC	Capitol Collaborative on Race and Equity	Racial inequities are evident across every indicator of well-being. From life expectancy, to health, education, income, and neighborhood design – race matters. In order to advance racial equity, SGC is working in collaboration with the Public Health Institute to support the Capitol Collaborative on Race & Equity– a racial equity capacity-building program for California state employees.	https://sgc.ca.gov/programs/hiap/racial-equity/
SGC	<i>Technical Assistance Guidelines for State Agencies</i>	This guidance offers best practices to help state agencies evaluate options, make key decisions, and avoid pitfalls as they develop effective technical assistance programs.	https://sgc.ca.gov/programs/cace/resources/guidelines/
University of California Institute of Transportation Studies	<i>Driving California's Transportation Emissions to Zero</i>	The purpose of this study is to provide a research-driven analysis of possible policy options that could, if combined, put the state on the pathway to a carbon-neutral transportation system by 2045. Funding for the research was provided by the Budget Act of 2019 through a contract with the California Environmental Protection Agency.	https://calepa.ca.gov/climate/carbon-neutrality-studies/
University of California Santa Barbara	<i>Enhancing Equity While Eliminating Emissions in California's Supply of Transportation Fuels</i>	To help the state of California achieve its carbon neutrality goal, a team of researchers from the University of California Santa Barbara completed this study commissioned by the California Environmental Protection Agency that examines options for reducing the state's supply of transportation fuel in parallel with reductions in demand. The report also considers paths to promote health and economic equity in the process of decarbonizing the transportation sector.	https://calepa.ca.gov/climate/carbon-neutrality-studies/

Appendix B: Analysis of Potential Investment Types

To identify funding recommendations, this appendix analyzes how over 30 potential investment types align with the guiding principles using the suite of metrics identified in Table 3. The analysis of each investment types includes a brief description, information on existing California Climate Investments that have funded the investment type (if applicable), and an overview of the analytical results for each guiding principle. To assess GHG cost-effectiveness, priority population benefits,⁴³ and direct jobs, the analysis used California Climate Investments reported data unless otherwise noted. For the remainder of the metrics, the analysis relied on a combination of reported data, external research, and stakeholder input. Table 5 includes a summary of the results.

Analysis of Sector-Specific Investment Types by Sector

Sustainable Transportation and Communities

Active transportation

Investments in active transportation include the construction of new biking and walking paths, bike and pedestrian improvements to make active transportation easier and safer, funding for bike or scooter share programs, or incentives for individual purchases of active transportation rideables like electric bikes. California Climate Investments programs that fund active transportation include the California Natural Resources Agency's Urban Greening program; the SGC's Transformative Climate Communities and Affordable Housing and Sustainable Communities programs; and CARB's Clean Cars 4 All, Clean Mobility Options, and Sustainable Transportation Equity Project programs.

- Support implementation of state climate goals: While active transportation projects are relatively costly on a GHG cost-effectiveness basis, these projects make important contributions to state climate goals by reducing VMT and fuel consumption. When implemented widely at a scale that achieves complete, interconnected networks and high usage rates, active transportation can play a transformative role in how people travel.
- Advance equity and environmental justice: Over 90 percent of California Climate Investments funding for active transportation has benefited priority populations. Active transportation investments are particularly important for communities and individuals with limited access to cars, or that may have unreliable cars. Recently, California Climate Investments has provided funding for community-led transportation planning processes. State climate programs can build on these efforts to ensure that active transportation projects are designed to meet local community needs, maximizing effectiveness and supporting equity principles.
- Improve public health: Active transportation investments can deliver significant public health benefits through increased physical activity, access to the outdoors, and reduced air pollution from an associated reduction in car trips. To protect public health, it is important to develop active transportation projects in ways that do not increase exposure to existing air pollution or the risk of injury or death from automobile collisions. To the extent that active transportation investments facilitate mobility and access to job centers, healthcare, or other services, they can help address social determinants of health.
- Support a climate-resilient and prosperous economic future: Active transportation investments can provide travel savings. Programs implementing this investment type have reported direct jobs. Active transportation investments can also support high road jobs to design, construct, and maintain nature-based climate solutions to ensure long-term benefits of these investments.

⁴³ In some cases, investment types that deliver important benefits to underserved communities may not reflect benefits to priority populations in the California Climate Investments dataset. This may be because projects are located outside of priority population areas, projects do not provide direct, meaningful, and assured benefits, or because a methodology does not yet exist to attribute benefits to priority population data. Continuing to identify opportunities to expand the number of programs providing benefits to priority populations is important to meaningfully advance equity across the portfolio.

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- Foster interagency coordination: Active transportation investments present many opportunities for interagency coordination. For example, natural and working lands projects like coastal restoration or urban greening can integrate bike and pedestrian pathways. Funding exists for active transportation projects outside of the GGRF, most notably through a set of California Transportation Commission transportation programs funded through SB 1 (Beall, Chapter 5, Statutes of 2017) and other transportation funding sources. Prioritizing active transportation within the portfolio of transportation funding is an important strategy as part of EO N-19-19 implementation.

Affordable housing development

Affordable housing investment includes development or renovation and preservation of deed-restricted affordable and mixed-income housing. California Climate Investments programs that fund and preserve affordable housing include SGC's Affordable Housing and Sustainable Communities and Transformative Climate Communities programs.

- Support implementation of state climate goals: While affordable housing investments are relatively costly on a GHG cost-effectiveness basis, development or preservation of affordable housing that reduces VMT, avoids displacement of existing residents, and increases access to and use of low-carbon transportation options is critical to reducing VMT in California and meeting state climate goals. Such housing projects may further contribute to state climate goals by catalyzing additional climate benefits beyond the project itself, including spurring additional, adjacent community investments and increasing demand for and use of public transit.
- Advance equity and environmental justice: Over 80 percent of California Climate Investments funding for affordable housing development has benefited priority populations. With housing becoming increasingly unaffordable, expanding affordable housing, particularly in areas with transit options that increase access to opportunities, is core to addressing deep inequities in California. SGC's programs that fund affordable housing are community-driven and include significant technical assistance.
- Improve public health: Providing safe and affordable housing directly addresses many social determinants of health. Fundamentally, all people need secure and affordable housing to thrive. VMT reductions reduce air pollution. Aligning housing developments with active transportation can promote increased physical activity.
- Support a climate-resilient and prosperous economic future: In addition to providing a basic need for safe and affordable housing, energy-efficient infill affordable housing development provides fundamental economic benefits by linking people to transportation and economic opportunities and reducing energy and travel costs. Programs implementing this investment type have reported direct jobs.
- Foster interagency coordination: SGC's programs that fund affordable housing are inherently cross-sectoral, incorporate multiple kinds of investment types, and are informed by an interagency executive committee that brings a variety of disciplines and state priorities together. This integrated approach can provide a model for cross-cutting investment approaches. Because affordable housing development involves the construction or retrofit of buildings, there are numerous opportunities to align with other climate strategies including transit and active transportation, building decarbonization, urban greening, energy efficiency and distributed clean energy generation, and ZEV charging infrastructure. While there are several non-GGRF funding sources for housing development, SGC's Affordable Housing and Sustainable Communities remains an important source of funding by promoting a climate-focused model for affordable housing development.

Shared mobility services

Shared mobility services include car and bike sharing programs, rideshare, vanpools, paratransit, and other investment types that facilitate mobility without relying on personal vehicle ownership. California Climate Investments programs that fund shared mobility services include CARB's Clean Mobility Options and Sustainable Transportation Equity Project programs, the California State Transportation Agency's Transit and Intercity Rail Capital Program, the California Department of Transportation's Low Carbon Transit Operations Program, and SGC's Transformative Climate Communities and Affordable Housing and Sustainable Communities programs.

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- Support implementation of state climate goals: While shared mobility investments are relatively costly on a GHG cost-effective basis, these projects make important contributions to state climate goals by funding deployment of ZEVs, reducing VMT, and reducing fuel consumption.
- Advance equity and environmental justice: 100 percent of California Climate Investments funding for shared mobility services has benefited priority populations. It is important to design these services in ways that support transportation options for residents and complement, rather than replace, transit services.
- Improve public health: Shared mobility services can improve public health through reduced air pollution from an associated reduction in car trips. In cases where shared mobility options involve active transportation, these investments can also support exercise. To the extent that shared mobility investments facilitate mobility and access to job centers, healthcare, or other services, they can help address social determinants of health.
- Support a climate-resilient and prosperous economic future: Investments in shared mobility services can provide cost savings, although it is important to advance service fares are made affordable. Programs implementing this investment type have reported direct jobs.
- Foster interagency coordination: Coordinating shared mobility investments with community transportation needs assessments and other community-led planning efforts can ensure that these investments are responsive to community needs and maximize their impact. There are limited state funding sources for grant funding for shared mobility services other than the GGRF.

Transit services

Transit service investments include a wide range of investment types, including new or expanded bus, rail, and ferry services, new transit vehicles, equipment, and infrastructure, free or discounted transit passes, infrastructure improvements to encourage ridership, and development of high-speed rail. California Climate Investments programs that provide transit-specific funding include the California State Transportation Agency's Transit and Intercity Rail Capital Program, the California Department of Transportation's Low Carbon Transit Operations Program, and the California High Speed Rail Project. CARB's Low Carbon Transportation and Community Air Protection Incentives programs also provide incentives for clean transit vehicles, and SGC's Transformative Climate Communities and Affordable Housing and Sustainable Communities programs support transit services and discounted transit passes.

- Support implementation of state climate goals: Transit investments are fairly GHG cost-effective relative to some other sustainable transportation investments.⁴⁴ These investments play a critical role in deploying heavy-duty ZEV technology like buses and rail, reducing passenger VMT, reducing fossil fuel use, and improving transit system efficiency to further reduce VMT and emissions. With significant transit electrification, energy consumption can increase, although California Climate Investments transit projects often include renewable energy generation to deliver a low-carbon transit system.
- Advance equity and environmental justice: Nearly 95 percent of California Climate Investments funding for transit service and operation has benefited priority populations, excluding investments in the High-Speed Rail Project.⁴⁵ Ensuring access to reliable, safe, convenient, and affordable transit is a critical component of developing equitable communities by providing a key mobility option for all community members to reach jobs, healthcare, and other important destinations. Programs investing in transit services have expanded technical assistance to support applications and project implementation.

⁴⁴ GHG-cost effectiveness and VMT discussions for transit services do not include estimates of reductions from the High-Speed Rail Project, which is anticipated to provide significant future reductions in VMT and GHG emissions once complete.

⁴⁵ Implementation of the High-Speed Rail Project provides a variety of benefits to Californians, including benefits that result from a proven focus on small business contracting and hiring disadvantaged workers, including those in disadvantaged communities. However, California Climate Investments does not assess these benefits, and therefore High-Speed Rail Project implementation does not currently contribute towards meeting statutory investment minimums for benefits to priority populations.

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- Improve public health: Transit investments reduce criteria air pollutant and diesel PM emissions by reducing the use of passenger vehicles and using zero-emission vehicles and equipment. To the extent that expanded transit facilitates mobility and access to job centers, healthcare, or other services, they can help address social determinants of health.
- Support a climate-resilient and prosperous economic future: Transit systems employ large numbers of people, presenting ongoing opportunities to support workforce development and improved job quality. Transit investments also support an economic recovery by providing travel cost savings and connecting transit riders with their employment destinations. Planning for climate change impacts and integrating resiliency measures is important to ensure continued functioning of transit infrastructure.
- Foster interagency coordination: Transit investments connect to a variety of other projects including affordable housing, active transportation, and shared mobility, presenting significant opportunities to link these investments and develop projects holistically to maximize VMT reductions and community benefits. Coordinating transit investments with community transportation needs assessments and other community-led planning efforts can ensure that these investments are responsive to community needs and maximize their impact. Additional coordination opportunities exist for transit projects to integrate nature-based solutions like urban greening. GGRT-funded projects can complement these funds and provide models for transit investments that incorporate ZEV technologies and focus on priority populations to support widespread adoption of these practices.

Zero-emission vehicles, equipment, and infrastructure

Investment types supporting zero-emission vehicles, equipment, and infrastructure cover a variety of technology types, funding mechanisms, and technology development phases. California Climate Investments programs, including CARB's Low Carbon Transportation, Funding Agricultural Replacement Measures for Emissions Reductions, and Community Air Protection Incentives programs, have provided vouchers, rebates, and financing assistance for both on- and off-road zero-emission vehicles and equipment including light-, medium-, and heavy-duty vehicles, off-road freight vehicles and equipment, agricultural equipment, and lawn and garden equipment. These programs have also provided grant funding for electric vehicle charging and hydrogen refueling infrastructure. Within California Climate Investments, SGC's Transformative Climate Communities and Affordable Housing and Sustainable Communities programs, the California State Transportation Agency's Transit and Intercity Rail Capital Program, and the California Department of Transportation's Low Carbon Transit Operations Program, also fund zero-emission vehicles, equipment, and infrastructure.⁴⁶

- Support implementation of state climate goals: Investments in zero-emission vehicle, equipment, and charging or hydrogen fueling infrastructure have moderate GHG cost-effectiveness. However, the cost-effectiveness varies significantly depending on the vehicle or equipment sector. Some investments have other goals in mind, such as demonstration projects for early-stage technologies to spur commercialization, and equity-based investments designed to ensure investments reach priority populations. Investments in zero-emission vehicles and equipment can reduce energy consumption and directly contribute towards zero-emission vehicle and equipment deployment goals. There are ongoing opportunities to support early-stage development, especially for zero-emission agricultural and construction equipment, marine vessels (including ferries), and locomotives.

⁴⁶ State programs have funded a combination of zero-emission, cleanest available combustion, and hybrid technologies in support of climate and air quality goals. The Plan prioritizes zero-emission technology to maximize progress on EO N-79-20 and achieve our long-term climate goals, which depend on eliminating combustion technologies in as many applications as possible.

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- Advance equity and environmental justice: Historically, California Climate Investments funding for vehicles, equipment, and charging or hydrogen fueling infrastructure, has overwhelmingly benefited priority populations. However, the benefits to priority populations can vary widely depending on the sector and focus of the investment, as several programs have an explicit equity focus. Light-duty equity-focused programs, which could include deep subsidies for vehicle purchases, financing assistance, charging cost subsidies, or any number of other mechanisms to reduce barriers, and electrification of diesel equipment in priority populations offer significant opportunities to ensure that the communities that are most in need benefit from these funds. For heavy-duty investments, larger fleets may have easier access to financing options. Focusing heavy-duty investments on smaller-scale fleets can also support equity goals by supporting truck owners that may be less able to purchase new trucks without subsidies.
- Improve public health: Zero-emission technologies can deliver public health benefits through reduced criteria air pollutant and diesel PM emissions.
- Support a climate-resilient and prosperous economic future: Zero-emission technologies can save on fuel costs. Vehicle-grid integration, which involves electric vehicles having a two-way interconnection with the grid to provide grid services, can save on energy costs and support a more climate-resilient grid by providing energy storage and back-up power. In addition, the transformation of the transportation sector to zero emissions presents important workforce development opportunities. Programs implementing this investment type have reported direct jobs.
- Foster interagency coordination: The state has a broad portfolio of investments in this sector. In addition to incentives for vehicles, investment in infrastructure is critical to achieve ZEV goals. These investments should continue to be coordinated to ensure that vehicles and infrastructure are deployed in a complementary fashion. GGRF investments play a key role in providing funding for vehicles and equipment, particularly for smaller fleets and priority populations. The California Energy Commission and the California Public Utilities Commission (CPUC) provide or administer the majority of investments in electrical and hydrogen fueling infrastructure. Continuing to coordinate this funding and working towards a streamlined consumer experience applying for incentives for vehicles and equipment, incentives for infrastructure, interconnection with the grid, and associated grid needs from local utilities can help maximize effectiveness of these investments.

Low-Carbon Energy, Buildings, and Industry

Advanced technologies for back-up power and grid resiliency

As the state electrifies its transportation system and buildings, grid reliability will become increasingly important. Investments in reliable, back-up power generation enhance the resiliency of the grid to power outages. Maintaining power supply to residences, data centers, hospitals, cell phone towers, and other critical infrastructure is particularly important. Back-up power technologies can be deployed at a variety of scales along the power grid including individual buildings or pieces of infrastructure, community-scale installations, at electrical substations, or others. Many technologies that can supply back-up power also provide distributed power generation near where the energy will be used, reducing dependence on the electricity grid for power.

California Climate Investments has not invested heavily in back-up power, although the California Energy Commission's Food Production Investment Program has funded solar-powered microgrids with energy storage at food production facilities to help ensure reliable power supply and reduce dependence on the grid.

- Support implementation of state climate goals: Increased back-up power is an important component of ensuring that individuals and businesses are resilient to power outages, which is necessary to enable the transition to electrified buildings and transportation systems. Communities or utilities can also use distributed generation with energy storage to maintain electrical access during public-safety power shut-offs or other power outages. California Climate Investments does not have GHG cost-effectiveness data for advanced back-up power. Incentive funding can advance early-stage technologies like vehicle-to-grid integration.

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- Advance equity and environmental justice: While grid reliability is important to protect vulnerable populations statewide, new and existing installations of back-up power that use combustion technology can increase air pollution in priority populations. Subsidies for individual or community-scale advanced technology back-up power in priority populations to offset higher upfront costs of advanced technology can help ensure these groups have access to grid resiliency who may otherwise be unable to afford back-up power technologies.
- Improve public health: Increasing back-up power that uses diesel or other combustion technologies can increase localized air pollution including both diesel PM emissions and criteria air pollutants. Using advanced, non-combustion alternatives for new and existing installations can reduce a growing source of local diesel PM emissions.
- Support a climate-resilient and prosperous economic future: Back-up power enables the economy to continue operating during power outages, providing fundamental economic benefits. Like many other energy technologies, there are workforce opportunities associated with the manufacture and installation of these technologies.
- Foster interagency coordination: The CPUC's Self-Generation Incentive Program offers incentives for a variety of technologies that support energy storage. GGRF funding could augment these funding opportunities with a focus on zero emission technologies and applications that most significantly reduce GHG and air pollutant emissions in priority populations.

Building decarbonization

Building decarbonization is an emerging priority for the state. Building GHG emissions include emissions from building energy use and from embedded emissions associated with construction and building materials.

Building electrification

While energy efficiency for all fuel sources plays an important role in reducing the energy that buildings use, accelerated and widespread building electrification will be necessary to achieve state climate goals. Retrofitting existing buildings that use natural gas appliances with electric substitutes, like heat pump water heaters and heating and cooling systems, can be costly. To drive consumer adoption, programs that provide affordable financing mechanisms or incentives to defray upfront costs will be important, along with outreach and education for consumers and training for contractors. Natural gas to all-electric conversions in existing buildings must also address associated barriers such as existing electric panel and service line size to ensure that the increased electrical load can be supported. California Climate Investments has not funded programs explicitly focused on building electrification, but many programs implement projects that reduce building energy use and may incorporate electric appliances. Outside of California Climate Investments, the CPUC and the California Energy Commission are administering the Building Initiative for Low-Emissions Development (BUILD) and Technology and Equipment for Clean Heating (TECH) programs focused on building electrification, both funded through investor-owned utility Cap-and-Trade auction proceeds. The BUILD program caters to new affordable housing, while the TECH program caters to equipment market development for use in new and existing housing. The CPUC is also funding natural gas-to-electric appliance substitution programs through its energy efficiency portfolio and may incentivize heat pump water heaters through the Self Generation Incentive Program.

- Support implementation of state climate goals: Building electrification investments contribute to state goals by reducing natural gas consumption. Data on GHG cost-effectiveness are not currently available from California Climate Investments programs.
- Advance equity and environmental justice: Building electrification presents significant equity challenges. Low-income households and other priority populations are more likely to live in existing units that may be costly to retrofit. Investments should prioritize these populations and consider mechanisms to reduce or offset upfront costs and any potential increases in energy bills associated with switching from natural gas to electricity.
- Improve public health: Building electrification can provide significant public health improvements through improved indoor air quality. Reducing the use of natural gas in buildings also provides local outdoor air quality improvements.

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- Support a climate-resilient and prosperous economic future: California Climate Investments has not implemented programs focused specifically on building electrification and therefore does not have information on direct jobs associated with this investment type. However, building electrification will involve a significant number of both construction and manufacturing jobs associated with construction and manufacturing of new technologies, presenting opportunities to support high quality jobs and promote high-road workforce development programs.
- Foster interagency coordination: Opportunities exist to prioritize electric appliances through existing California Climate Investments programs such as California Department of Community Services and Development's Low-Income Weatherization Program, and SGC's Affordable Housing and Sustainable Communities program, and the California Energy Commission's Food Production Investment Program. California Climate Investments can also monitor implementation of CPUC and California Energy Commission programs focused on building electrification to identify lessons learned, incorporate findings into other state programs as appropriate, and consider providing additional funding through new or existing programs for activities like consumer rebates or financing assistance. Urban forestry and urban greening projects can complement these investments by shading buildings and reducing energy demand. Coordination across these programs can help integrate multi-sectoral strategies into projects and facilitate streamlined outreach across more programs.

Building material and construction decarbonization

Decarbonizing building materials could include incentives for various types of processes or materials. One example is the production or use of alternatives to cement, like manufactured wood products made with sustainably harvested forest residues, a byproduct from forest harvesting. These emerging activities have not been funded through California Climate Investments incentive programs.

- Support implementation of state climate goals: Building material and construction decarbonization strategies would reduce GHG emissions associated with manufacturing of building materials like cement. Data on GHG cost-effectiveness are not currently available from California Climate Investments programs.
- Advance equity and environmental justice: The equity implications for building material and construction decarbonization strategies are unknown.
- Improve public health: The public health implications for building material and construction decarbonization strategies are unknown.
- Support a climate-resilient and prosperous economic future: There are opportunities to promote high-road workforce development programs to support building material and construction decarbonization. California Climate Investments does not have information on direct jobs associated with this investment type.
- Foster interagency coordination: The state has committed to exploring strategies to develop markets for woody biomass, which can be converted into mass timber products and used in place of cement. The Governor's Office of Planning and Research is exploring financing strategies to support the supply-side of these emerging markets. There may be opportunities to align California Climate Investments funding to support demand for these materials. The state is also exploring opportunities to pilot innovative strategies to reduce the emissions associated with construction of affordable housing through the expansion of factory-built, prefabricated, energy-efficient affordable housing units. This novel concept may lower carbon emissions from building construction and operations while producing higher-density housing faster and at a lower cost than traditional construction.

Hydrofluorocarbon refrigerant emissions reductions

Investments to reduce refrigerant emissions include replacing refrigerants and/or refrigeration equipment with low-GWP substitutes, refrigerant charge and leakage reductions, and converting refrigeration systems to more energy-efficient alternatives with low-GWP refrigerants. Focusing on refrigeration for food retail presents the most promising near-term opportunity for emissions reductions. Integration of low-GWP heat pump technologies into building electrification incentives for low-GWP technology in other applications such as residential air conditioning units, industrial processing facilities, and cold storage warehouses can also provide important reductions. California Climate Investments programs that have funded refrigerant emissions reductions include CARB's Fluorinated-gas Reduction Incentive

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Program focused on supermarkets and the California Energy Commission's Food Production Investment Program focused on food production facilities.

- Support implementation of state climate goals: Accelerating reductions in high-GWP HFC gases is extremely important to achieving carbon neutrality. California Climate Investments has funded food retail refrigeration system replacements, which have been highly GHG cost-effective. These investments support early-stage application of technologies that can lead to more widespread adoption and provide significant GHG reductions above regulatory requirements. In some cases, these projects deliver energy savings through upgrades to more efficient technologies.
- Advance equity and environmental justice: Existing California Climate Investments food retail refrigeration projects have not provided priority population benefits. However, significant opportunities exist to promote equity through refrigerant emissions reductions by focusing on small-scale grocers that may have difficulty affording refrigeration system upgrades on their own. Other opportunities to benefit priority populations include offering low-GWP air conditioning units to low-income households.
- Improve public health: Refrigerant emission reduction projects could provide public health benefits by providing subsidized, low-GWP refrigeration systems to support expanded access to food in communities with inadequate refrigeration, although California Climate Investments has not yet invested in these project types. Low-GWP residential air conditioning systems could reduce health risk from extreme heat.
- Support a climate-resilient and prosperous economic future: Refrigerant emissions reduction projects present workforce development opportunities, particularly in partnership with local communities and businesses. In many cases, refrigeration system conversions, particularly at smaller grocers, can incorporate more energy-efficient technologies, saving energy costs. California Climate Investments does not have jobs data available for this investment type.
- Foster interagency coordination: There is significant potential to coordinate refrigerant emissions reduction projects with state energy and decarbonization efforts. For example, state and utility-based energy efficiency programs have focused on reducing emissions from refrigeration systems at supermarkets, which account for a significant share of supermarket energy use. These programs could incorporate additional measures to convert to low-GWP refrigeration systems. These projects could achieve additional reductions by converting to HFC-free refrigeration systems that not only refrigerate food products but also provide air conditioning and electric space and water heating, replacing uses of fossil gas. Additional opportunities include incorporating low-GWP air conditioning or heat pump water heating technologies into residential energy efficiency or building electrification programs, development of new workforce development programs, and advancing low-GWP refrigerants in alignment with any other projects that involve cold storage (e.g., food waste prevention and rescue). The California Energy Commission's Electric Program Investment Charge program may support research and development of climate-friendly heat pump technologies. California Climate Investments can monitor these and other efforts to identify additional opportunities to advance low-GWP refrigerants in additional applications.

Residential and commercial energy efficiency, renewable energy, and energy storage

The state has strong mandates that are driving increased deployment of renewable energy and energy efficiency. Investments in energy efficiency, renewable energy, and energy storage can include a variety of project types. The specific benefits vary significantly depending on the types of projects implemented and whether the project occurs at the residential or scale. The Plan analyzes each of these market segments separately to capture these variations.

Residential

Residential investment types include single- and multi-family energy efficiency retrofits, weatherization, rooftop or community solar, and home battery storage. California Climate Investments programs that have funded residential investments in these areas include the California Department of Community Services and Development's Low-Income Weatherization Program and SGC's Affordable Housing and Sustainable Communities and Transformative Climate Communities programs.

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- Support implementation of state climate goals: Residential investments are not always as GHG cost-effective as commercial or industrial investments, but address a critical energy sector and directly support state climate goals by reducing energy consumption and producing renewable electricity.
- Advance equity and environmental justice: Nearly 100 percent of California Climate Investments funding towards these investment types has benefited priority populations.
- Improve public health: Public health benefits include criteria air pollution reductions from reduced natural gas consumption and reduced extreme heat risk from weatherization projects. Improved ventilation can improve indoor air quality.
- Support a climate-resilient and prosperous economic future: These investment types reduce energy bills, providing direct economic benefits to priority populations and reducing owner operating costs for multi-family homes. Energy storage and vehicle-grid integration can support resiliency to power outages. For residences in and around wildlands, these benefits could be magnified by combining these investments with investments in home hardening against wildfire. Programs implementing this investment type have reported direct jobs.
- Foster interagency coordination: Natural gas and electric utilities offer a variety of programs that subsidize residential energy efficiency projects, solar, and battery storage, funded through a combination of ratepayer dollars and proceeds from the utilities' share of Cap-and-Trade auction proceeds. Programs may be more limited for customers outside of Investor-Owned Utility service areas. To align with state climate goals, energy efficiency programs can prioritize electric appliances, support vehicle-grid integration mechanisms through residential ZEV charging and battery storage, and promote the use of low-GWP refrigerants. Coordination across these programs can help integrate multi-sectoral strategies into projects and facilitate streamlined outreach across more programs.

Commercial

Commercial investment types include energy efficiency, solar panels, and energy storage in commercial buildings or farms. California Climate Investments programs that have funded these types of investments include the California Energy Commission's Renewable Energy for Agriculture Program.

- Support implementation of state climate goals: Commercial investments funded through California Climate Investments have been more GHG cost-effective than residential investments. They directly support state climate goals by reducing energy consumption and producing renewable electricity.
- Advance equity and environmental justice: 11 percent of California Climate Investments funding towards these investment types has benefited priority populations, although this is based on a relatively small number of projects relative to the residential market segment.
- Improve public health: Commercial energy efficiency projects that reduce natural gas consumption can reduce criteria air pollutant emissions.
- Support a climate-resilient and prosperous economic future: These investment types reduce energy bills, providing direct economic benefits. Energy storage can support resiliency to power outages. Programs implementing this investment type have not reported direct jobs.
- Foster interagency coordination: Natural gas and electric utilities operate a variety of programs focused on energy efficiency, solar, and storage rebates, subsidies, and financing assistance for business and commercial customers, funded through a combination of ratepayer dollars and proceeds from the utilities' share of Cap-and-Trade auction proceeds. To align with state climate goals, energy efficiency programs can prioritize electric conversions in commercial buildings and promote the use of low-GWP refrigerants.

Industrial Emissions Reductions

Industrial investment types include energy efficiency, fuel-switching, microgrids, larger-scale energy storage, integration of lower-GWP refrigerants, and the use of low-carbon fuels like RNG or hydrogen from low-carbon sources. California Climate Investments programs that have these types of investments include the California Energy Commission's Food Production Investment Program. For industrial sectors that will be particularly difficult to decarbonize, strategies like carbon capture and sequestration will be necessary to achieve carbon neutrality.

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Direct air capture technologies can also help remove residual emissions from all sectors from the atmosphere. California Climate Investments does not have information on these projects and does not analyze them further.

- Support implementation of state climate goals: Industrial investments that California Climate Investments programs have implemented have generally been highly cost-effective, taking advantage of significant opportunities to improve industrial energy efficiency. They directly support state climate goals by reducing energy consumption and producing renewable electricity. In some cases, industrial energy efficiency projects can advance emerging, early-stage technologies.
- Advance equity and environmental justice: 94 percent of California Climate Investments funding towards these investment types has benefited priority populations.
- Improve public health: Industrial energy efficiency projects that reduce natural gas or other fossil fuel consumption can reduce criteria air pollutant emissions, although the local public health benefits may be less significant than for residential projects.
- Support a climate-resilient and prosperous economic future: Industrial projects that reduce energy use can deliver energy bill savings, providing direct economic benefits. Energy storage and microgrids can support resiliency to power outages. Programs implementing this investment type have reported direct jobs.
- Foster interagency coordination: Natural gas and electric utilities provide some incentives for industrial energy efficiency and renewable energy projects. Prioritizing funding for industrial projects that maximize local air pollution benefits and at facilities that do not receive other state incentives (e.g., credits through CARB's Low Carbon Fuel Standards program) can help maximize the use of state incentive dollars.

Woodstove replacement

Woodstove replacement investments include incentives for homeowners to replace old, inefficient, and highly polluting woodstoves, wood inserts, or fireplaces with cleaner burning and more efficient home heating devices. California Climate Investments programs that have funded woodstove replacements include CARB's Woodsmoke Reduction Program.

- Support implementation of state climate goals: Woodstove replacements reduce black carbon emissions and are highly GHG cost-effective.
- Advance equity and environmental justice: 86 percent of California Climate Investments funding towards woodstove replacements has benefited priority populations.
- Improve public health: Woodstove replacements improve indoor air quality, providing significant public health benefits.
- Support a climate-resilient and prosperous economic future: Programs implementing this investment type have not reported direct jobs.
- Foster interagency coordination: Woodstove replacements can help advance state building decarbonization goals by focusing on electrical heating options. Woodstove replacements can potentially be integrated into other existing energy efficiency and renewable energy programs.

Natural and Working Lands

Conservation easements

Conservation easements are voluntary, legally binding agreements between landowners and land trusts that permanently limit uses of the land to protect conservation values. This is one tool that the state has used to support land conservation, although it is not the only tool available. California Climate Investments programs that have funded conservation easements include the Department of Conservation's Sustainable Agricultural Lands Conservation program, CAL FIRE's Forest Health Legacy Program, and the Wildlife Conservation Board's Climate Adaptation and Resiliency Program.

- Support implementation of state climate goals: Conservation easements directly support state natural and working land conservation goals. They can be a very cost-effective approach to avoid GHG emissions and sustain carbon sequestration. Opportunities exist to drive these benefits even further by integrating sustainable management practices on properties. Easements developed in coordination with regional planning can focus housing growth in already-developed areas in ways that reduce VMT, establish contiguous wildlife corridors, and protect those parcels with greatest value for agriculture, wildlife, or providing other natural services.

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- Advance equity and environmental justice: Only a small percentage of conservation easement funds have benefited priority populations. Agencies can consider additional opportunities to advance equity through these investments, such as prioritizing socially disadvantaged farmers as potential recipients of agricultural easements or developing easements in ways that improve water quality for nearby priority populations.
- Improve public health: Conservation easements that reduce VMT can provide air quality benefits through avoided air pollution from vehicles. To the extent that conservation easements include public access, they can promote outdoor recreation, delivering additional public health benefits.
- Support a climate-resilient and prosperous economic future: Conservation easements can incorporate important climate resiliency benefits like flood prevention and improved water quality. Conservation easements can provide an injection of funding for landowners. Programs implementing this investment type have reported direct jobs.
- Foster interagency coordination: Conservation easements can be aligned with regional planning efforts, active transportation investments, public access to outdoor recreation opportunities, and other natural and working land climate strategies to maximize climate, resiliency, and public health benefits. There are some federal sources of funding available, but GGRF-funded investments can also play an important role in advancing land ownership projects in California.

Forest restoration and management

Forest restoration and management includes a variety of strategies to improve forest health and conserve land including reforestation, fuel reduction, prescribed burning, pest management, conservation easements, and forest biomass utilization. California Climate Investments programs that fund forest restoration and management include CAL FIRE's Forest Health and Forest Carbon Plan Implementation programs.

- Support implementation of state climate goals: Forest restoration and management projects are among the most GHG cost-effective of all investment types. These projects can support carbon neutrality while contributing to energy generation and waste diversion goals, while accelerating climate smart management of California's natural and working lands.
- Advance equity and environmental justice: Approximately 35 percent of existing California Climate Investment funding for forest restoration and management projects has benefited priority populations.
- Improve public health: Some forest restoration and management practices can, in some cases, cause short-term local increases in criteria air pollutants. However, over time, investments in forest restoration and management can reduce the risk of catastrophic wildfires and related smoke impacts. Investments in forest restoration and management practices can also help maintain or improve water quality and storage, but these benefits not yet been quantified.
- Support a climate-resilient and prosperous economic future: Programs implementing this investment type have reported direct jobs. These projects are large in scale, and investments present significant opportunities for continuing and expanding workforce development and job training to meet important sector-specific employment needs. Existing coordination with the California Conservation Corps for job training and workforce development presents one model for continuing and expanding workforce development in the state. Continuing to identify opportunities to support high-quality jobs can further advance these goals.
- Foster interagency coordination: As wildfires have increased in severity, GGRF funding plays an important role by supporting longer-term, sustainable forest management. GGRF complements other state funded efforts to advance forest restoration and management.

Soil health on-farm field management practices

Soil health investment types include a variety of on-farm management practices to improve soil health, sequester carbon, and enhance ecosystem services. Practices include, but are not limited to, cover cropping, no-till, reduced-till, mulching, compost application, and conservation plantings. Within California Climate Investments, the California Department of Food and Agriculture's Healthy Soils Program provides incentives for implementation of these practices and demonstration events to promote awareness and widespread adoption.

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- Support implementation of state climate goals: Soil health practices are fairly GHG cost-effective. These projects contribute towards natural and working lands goals and carbon neutrality. Demonstration projects support early-stage practices.
- Advance equity and environmental justice: To date, approximately 35 percent of soil health investments have benefited priority populations. Investments could be targeted towards socially disadvantaged farmers to further advance equity goals.
- Improve public health: Soil health investments can reduce local criteria air pollutant emissions through reduced dust and, in some cases, reduced tractor use. As agricultural burning is phased out, there are some opportunities to use soil health investments to provide a sustainable use for agricultural waste through whole orchard recycling practices or composting.
- Support a climate-resilient and prosperous economic future: Soil health projects provide cost savings to farmers. Programs implementing this investment type have not reported direct jobs.
- Foster interagency coordination: There is limited non-GGRF funding for soil health on-farm field management practices.

Urban forestry and urban greening

Urban forestry and urban greening projects plant, cultivate, and maintain trees and other vegetation in urban areas. In some cases, urban greening projects include development of park space and active transportation infrastructure. California Climate Investments programs that have funded urban forestry and urban greening include CAL FIRE's Urban and Community Forestry program, the California Natural Resources Agency's Urban Greening program, SGC's Affordable Housing and Sustainable Communities and Transformative Climate Communities programs, and the State Coastal Conservancy's Climate Ready program.

- Support implementation of state climate goals: Urban forestry and urban greening investments vary widely in terms of GHG cost-effectiveness depending on the project components. They reduce energy consumption, contribute to accelerated climate smart management of California's natural and working lands, support waste diversion, and sequester carbon, supporting carbon neutrality.
- Advance equity and environmental justice: Nearly 100 percent of existing California Climate Investments funds for urban forestry and urban greening have benefited priority populations. In many cases, these projects have been developed in close consultation with community leaders.
- Improve public health: Urban forestry and urban greening provide important public health benefits by improving air quality and reducing extreme heat and providing access to active transportation and outdoor recreation activities. These projects have the potential to improve water quality and storage, although California Climate Investments does not have data on these potential benefits. Development of parks or other urban greenspaces like community gardens can also address social determinants of health through shared community land stewardship. Tree planting and ongoing care at schools presents particular opportunities to advance public health.
- Support a climate-resilient and prosperous economic future: Ongoing tree care is important to ensure that urban and community forestry and greening projects deliver benefits over the long term, presenting workforce development opportunities. Urban forestry and urban greening projects can help prevent floods, improve stormwater management, and reduce the impacts of extreme heat. Programs implementing this investment type have reported direct jobs.
- Foster interagency coordination: Many investment types, such as transportation or affordable housing development can increase benefits by integrating urban forestry and urban greening. There are limited non-GGRF funding sources available for these investments at the state level, although some community organizations conduct urban greening projects.

Wetland, meadow, and coastal restoration and management

Wetland, meadow, and coastal restoration and management restores and enhances these ecosystems to sequester carbon and provide additional ecosystem services like improved water quality and flood control. California Climate Investments programs that have funded wetland, meadow, or coastal restoration and management include the California Department of Fish and Wildlife's Wetlands and Watershed Restoration Program, the State Coastal

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Conservancy's Climate Ready program, and the Wildlife Conservation Board's Climate Adaptation and Resiliency Program.

- Support implementation of state climate goals: Wetland, meadow, and coastal restoration and management investments are among the most GHG cost-effective within the California Climate Investments portfolio. They also contribute to natural and working land goals and sequester carbon, supporting carbon neutrality while preserving important habitats and biodiversity.
- Advance equity and environmental justice: About half of existing California Climate Investments funding for wetland restoration and management has benefited priority populations.
- Improve public health: Wetland restoration and management improves water quality and, for those efforts that integrate tree planting, can reduce criteria air pollutant emissions, although this is not necessarily a component of all projects. To the extent that these investments incorporate public access to the spaces, they can deliver additional public health benefits.
- Support a climate-resilient and prosperous economic future: Coastal restoration projects can protect against significant economic disruption associated with sea level rise. Programs implementing this investment type have not reported direct jobs, although maintaining these project types requires employment over time.
- Foster interagency coordination: There are limited non-GGRF funding sources for these investments.

Livestock

Anaerobic digestion of dairy manure

Anaerobic digestion of dairy manure involves capturing methane emitted from the decomposition of manure. Projects will typically upgrade the captured biogas into pipeline quality RNG for pipeline injection and use as transportation fuel. Other options include installing internal combustion engines, microturbines, or fuel cells to generate electricity, which can support electric vehicle charging and distributed power generation. Within California Climate Investments, the California Department of Food and Agriculture's Dairy Digester Research and Development Program has provided funding for dairy digesters. The CPUC's dairy biomethane pilot program and monetary pipeline interconnection incentive have also provided complementary funding.

- Support implementation of state climate goals: Methane is a short-lived climate pollutant with significantly higher global warming potential than carbon dioxide, and near-term reductions are critical to achieving state climate goals. Dairy digesters are a key technology for reducing a significant source of methane in California and are among the most GHG cost-effective investment types. Using technology like fuel cells to generate electricity for electric vehicle charging supports state ZEV deployment and renewable electricity goals. Pipeline injection projects can provide biomethane to difficult-to-decarbonize sectors, further supporting state climate goals.
- Advance equity and environmental justice: Approximately 70 percent of anaerobic digestion of dairy manure investments funded through California Climate Investments have benefited priority populations.
- Improve public health: Depending on the technology used, dairy digester projects have the potential to reduce some criteria air pollutants. To the extent that the biomethane replaces diesel fuel, the investments can reduce diesel PM emissions. However, ongoing large-scale dairy and livestock operations continue to generate other sources of emissions and groundwater contamination. The California Department of Food and Agriculture has taken steps to mitigate potential impacts associated with dairy digester projects, including requiring demonstration of protection of water and air quality and prohibiting dairies from increasing herd size beyond existing permits during the project term. Maintaining these requirements is important to ensure continued protection of public health.
- Support a climate-resilient and prosperous economic future: Programs implementing this investment type have reported direct jobs.

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- Foster interagency coordination: There are limited funding sources for grant funding for dairy digesters other than the GGRF. Many of these projects generate environmental credits through the Cap-and-Trade Program, the Low Carbon Fuel Standard Program, and the federal Renewable Fuel Standard Program.

Alternative manure management

Alternative manure management investments provide funding for non-digester manure management practices that reduce methane emissions from livestock manure, such as pasture-based management, alternative manure treatment and storage, and solid separation. California Climate Investment has funded these practices through the California Department of Food and Agriculture's Alternative Manure Management Program.

- Support implementation of state climate goals: Methane is a short-lived climate pollutant with significantly higher global warming potential than carbon dioxide, and near-term reductions are critical to achieving state climate goals. Alternative manure management investments provide critical methane reductions from livestock manure and are highly GHG cost-effective, although these practices are not as cost-effective as anaerobic digestion of dairy manure. Because these projects are typically implemented at smaller dairies or at dairies that may not be appropriate for a digester, they fill an important gap in the state's methane reduction efforts. Investments in alternative manure management can contribute to broader natural and working lands goals through enhanced manure utilization.
- Advance equity and environmental justice: Alternative manure management programs funded through California Climate Investments have not historically benefitted priority populations. However, new approaches, such as targeted technical assistance,⁴⁷ can help underserved populations outside of the priority population definitions access these benefits.
- Improve public health: Alternative manure management projects reduce criteria air pollutants, providing local public health benefits, and help with nutrient management and control, which may reduce the likelihood of impacts to water quality.
- Support a climate-resilient and prosperous economic future: Programs implementing this investment type have not reported direct jobs.
- Foster interagency coordination: There are limited non-GGRF funding sources for alternative manure management projects.

Enteric fermentation reduction

Enteric fermentation, or fermentation that takes place in the digestive systems of livestock, accounts for approximately half of livestock methane emissions in California. Emerging technologies and strategies like feed additives, diet modifications, vaccines, emissions-reducing bovine wearables, efficiency improvements, and selective breeding for reduced emissions are under development to reduce these emissions. California Climate Investments has not funded enteric fermentation reduction projects.

- Support implementation of state climate goals: Methane is a short-lived climate pollutant with significantly higher global warming potential than carbon dioxide, and near-term reductions are critical to achieving state climate goals. Enteric fermentation emissions remain uncontrolled in California, and emissions reduction technologies have not been commercially demonstrated. Existing research efforts present an opportunity for early-stage incentive funding to deploy new techniques. If successful, investments in enteric fermentation reductions would fill an important gap in the state's methane reduction efforts.
- Advance equity and environmental justice: Investments could be targeted towards socially disadvantaged farmers.
- Improve public health: Public health benefits may be determined as projects are implemented but are currently unknown.

⁴⁷ For example, the California Department of Food and Agriculture currently targets a minimum of 25 percent of its technical assistance funding to assisting socially disadvantaged farmers with applications to its suite of GGRF-funded Climate Smart Agriculture programs. Socially disadvantaged farmers are defined by the Farmer Equity Act of 2017 to include members of "groups whose members have been subjected to racial, ethnic, or gender prejudice because of their identity as members of a group without regard to their individual qualities," including members of the following groups: African Americans, Native Indians, Alaskan Natives, Hispanics, Asian Americans, and Native Hawaiians and Pacific Islanders (Food and Agricultural Code §512(c)).

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- Support a climate-resilient and prosperous economic future: Economic benefits may be determined as projects are implemented. California Climate Investments does not have data available on direct jobs associated with this project type.
- Foster interagency coordination: There are limited non-GGRF funding sources for enteric fermentation reductions. These investments could be paired with research or program evaluation funding to understand GHG reductions and other benefits.

Waste Diversion

Anaerobic digestion of municipal waste

Investments in anaerobic digestion of municipal waste divert organic waste from landfills and use the biogas to generate electricity or upgrade to RNG for pipeline injection. California Climate Investments programs that have funded anaerobic digestion of municipal waste include CalRecycle's Organics Grants and Organics and Recycling Loans programs.

- Support implementation of state climate goals: Municipal waste anaerobic digesters reduce organic waste sent to landfills, supporting statewide requirements for increased organic waste diversion. These projects are highly GHG cost-effective. They can be a source of renewable energy including electricity or RNG for difficult-to-decarbonize sectors.
- Advance equity and environmental justice: Nearly 90 percent of California Climate Investments funds for municipal waste anaerobic digestion projects have benefited priority populations.
- Improve public health: Anaerobic digestion projects can reduce criteria air pollutant emissions by diverting waste away from landfills. These projects can include food recovery components through Community Benefits Agreements, increasing food access.
- Support a climate-resilient and prosperous economic future: Programs implementing this investment type have reported direct jobs.
- Foster interagency coordination: There are limited funding sources for grant funding for anaerobic digestion of municipal waste other than the GGRF.

Compost production

Compost production investments include construction, renovation, or expansion of infrastructure for composting and grants for communities to operate small-scale composting programs. California Climate Investments programs that have funded compost production include CalRecycle's Organics Grants, Organics and Recycling Loans, and Community Composting for Green Spaces Grant programs and SGC's Transformative Climate Communities program.

- Support implementation of state climate goals: Investments in compost production are highly GHG cost-effective and support state goals to divert organic waste from landfills. The production of compost supports sustainable agricultural practices and other climate smart land management strategies for California's natural and working lands.
- Advance equity and environmental justice: Approximately 70 percent of existing California Climate Investments funding for compost production has benefited priority populations. This does not include funding for community composting, which is specifically focused on priority populations. Continued emphasis on community-led projects can continue to advance equity goals.
- Improve public health: Compost production promotes public health by reducing air pollution at landfills, although there may be localized emissions increases at the composting facilities. Community composting projects can address social determinants of health through shared community land stewardship. Although California Climate Investments has not implemented these kinds of projects, there are opportunities to coordinate community composting with urban gardens and local food systems to provide additional benefits.
- Support a climate-resilient and prosperous economic future: Programs implementing this investment type have reported direct jobs.

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- Foster interagency coordination: Opportunities exist to align compost production investments with community-led planning efforts and urban greening projects. Transportation infrastructure projects can also incorporate compost, creating a potentially significant demand for the supply of compost. There are limited non-GGRF funding sources for compost production.

Food waste prevention and rescue

Food waste prevention and rescue investments provide grants to prevent food waste and recover edible food for human consumption to reduce the amount of food being disposed in landfills. California Climate Investments programs that fund food waste prevention and rescue include CalRecycle's Food Waste Prevention and Rescue Grant program and SGC's Transformative Climate Communities program. Other CalRecycle programs historically incorporated food rescue activities, although these efforts are now centralized through the Food Waste Prevention and Rescue Grant program.

- Support implementation of state climate goals: Food waste prevention and rescue supports a variety of state climate goals by providing highly-cost effective GHG reductions, reducing methane emissions, diverting organic waste, and rescuing food for human consumption. Some projects can increase VMT due to the purchase of new vehicles to collect and distribute food, presenting opportunities to incorporate ZEVs into these projects.
- Advance equity and environmental justice: Nearly 100 percent of existing California Climate Investments funding for food waste prevention and rescue has benefited priority populations.
- Improve public health: Food waste prevention and rescue promotes public health by providing access to food. These projects also reduce criteria air pollutants associated with landfill disposal and diesel PM emissions when they incorporate zero-emission trucks and freight equipment.
- Support a climate-resilient and prosperous economic future: Programs implementing this investment type have reported direct jobs.
- Foster interagency coordination: Food waste prevention and rescue can coordinate with community planning efforts and incentives for low-GWP refrigerants. There are also opportunities to coordinate with community-led planning efforts. There are limited non-GGRF funding sources for food waste prevention and rescue.

Recycling infrastructure

Investments in recycling infrastructure include new or expanded recycling infrastructure to process paper, plastic, fiber, and glass. California Climate Investments programs that have funded recycling infrastructure include CalRecycle's Organics and Recycling Loans and the Recycled Fiber, Plastic, and Glass Grants programs.

- Support implementation of state climate goals: Recycling infrastructure investments are very GHG cost-effective and contribute to overall state waste diversion goals. Investing in the state's recycling infrastructure to manage a wide range of recovered materials and develop a circular economy can reduce upstream GHG emissions and conserve natural resources.
- Advance equity and environmental justice: About 50 percent of existing California Climate Investments funding for recycling infrastructure has benefited priority populations.
- Improve public health: Recycling infrastructure reduces criteria air pollutant emissions associated with landfill disposal.
- Support a climate-resilient and prosperous economic future: Programs implementing this investment type have reported direct jobs.
- Foster interagency coordination: There are limited non-GGRF funding sources for recycling infrastructure projects.

Water

Energy efficiency for agricultural irrigation

Investment types to increase the energy efficiency of agricultural irrigation include soil moisture monitoring, drip systems, switching to low pressure irrigation systems, pump retrofits and replacements, variable frequency drives and installation of renewable energy to reduce

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on-farm water use and energy. California Climate Investments has funded these projects through the California Department of Food and Agriculture's State Water Efficiency and Enhancement Program, although it has been several years since GGRF funds were appropriated to this program.

- Support implementation of state climate goals: Agricultural energy efficiency projects are more GHG cost-effective than many other investment types, although they are less cost-effective than industrial energy-efficiency projects or many natural and working lands investments.
- Advance equity and environmental justice: About 37 percent of existing California Climate Investments funds for increasing energy efficiency of agricultural irrigation have benefited priority populations. Investments could be targeted towards socially disadvantaged farmers.
- Improve public health: Agricultural irrigation energy and efficiency investments provide public health benefits by reducing emissions of criteria air pollutants and diesel PM.
- Support a climate-resilient and prosperous economic future: They save energy costs through efficiency improvements. Programs implementing this investment type have not reported direct jobs.
- Foster interagency coordination: Funding for these investment types has, in recent years, primarily come from non-GGRF sources. Continuing to coordinate on methodologies and co-benefit estimates is important for ensuring alignment across state agencies.

Energy-saving water-consuming appliances

Investment types include incentives for appliances that reduce energy and water use at households, institutions, and businesses. California Climate Investments has funded these investments through the Department of Water Resources Water-Energy Grant Program, although it has been several years since GGRF funds were appropriated to this program.

- Support implementation of state climate goals: Energy-saving water-consuming appliance installations are moderately GHG cost-effective.
- Advance equity and environmental justice: About 62 percent of existing California Climate Investments funds for energy-saving water-consuming appliances have benefited priority populations.
- Improve public health: To the extent that the technologies replace natural gas appliances with electrical versions, these investments can reduce onsite criteria air pollutant emissions.
- Support a climate-resilient and prosperous economic future: Investments can reduce energy costs. Programs implementing this investment type have reported direct jobs.
- Foster interagency coordination: Investments in energy-saving water-consuming appliances could be integrated into energy efficiency efforts or integrated as a co-benefit into water-specific programming outside of the GGRF.

Analysis of Supporting and Cross-Sectoral Investment Types

The supporting and cross-sectoral investment types complement and bolster the suite of sector-specific investments to provide additional benefits and improve overall implementation. Investment in each of these activities is necessary to provide a holistic funding portfolio that can deliver on the multiple state goals. Rather than evaluate these investment types using the project-level metrics, this section focuses more broadly on tying these investment types to the guiding principles, discussing potential benefits, and highlighting opportunities for improvement to achieve additional benefits. The Plan uses this analysis to understand how these investment types fit within the broader funding portfolio and develop recommendations for funding to improve program administration.

Capacity building and technical assistance

Capacity building describes a broad range of activities designed to enable communities to apply for, participate in, and lead climate efforts. In many cases, capacity building refers to upstream efforts to increase community readiness for engaging in planning efforts and grant application and administration, prior to any project grant. Capacity building activities could include focused outreach; collaborative workshops or educational trainings; direct funding to community-based organizations or under-resourced local governments for personnel, planning, outreach, equipment, or broadband services; or any number of other activities that

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support a community's ability to understand community needs, access funding, and implement climate projects.

Technical assistance is often a complementary investment to capacity building and can similarly encompass a variety of activities. The most common form of technical assistance involves providing direct support to potential grantees for grant application development. Investments in technical assistance associated with specific grant applications can help build community capacity for future applications.

California Climate Investments has funded capacity building and technical assistance through multiple programs including CARB's Community Air Grants, Clean Mobility Options, and Access Clean California programs, the California Natural Resources Agency's Regional Forest and Fire Capacity program, the State Water Boards Safe and Affordable Drinking Water program, and SGC's Technical Assistance funds. Many individual California Climate Investments programs also use a portion of their funding to provide technical assistance and outreach. While not funded through California Climate Investments, SGC's Regional Climate Collaborative program, established through SB 1072 (Leyva, Chapter 377, Statutes of 2018), presents a new model for regional capacity building and working directly with communities to develop local leadership.

- Support implementation of state climate goals: While capacity building and technical assistance investments do not directly reduce GHG emissions, they can facilitate GHG emissions reductions in several ways. Broad-based technical assistance, including for applications and project implementation, can help the state identify and sustain better and more diverse projects to advance climate goals. Investing in capacity building represents a longer-term commitment to building local leadership for project development and implementation.
- Advance equity and environmental justice: Capacity building and technical assistance investments are core pillars of the state's efforts to achieve more equitable processes and outcomes within climate programs. These activities support priority populations and other underserved populations by:
 - Leveling the playing field for under-resourced communities.
 - Delivering a more equitable distribution of grant funding that does not overly favor applicants based on their existing resources by supporting under-resourced organizations during the grant application process.
 - Expanding existing activities and targeting these efforts to the most under-resourced populations.
 - Identifying and addressing barriers to accessing funds.
- Improve public health: Capacity building and technical assistance activities do not directly improve public health but can help communities more readily access funds for projects that do. In some cases, capacity building can address social determinants of health by fostering civic participation and social cohesion.
- Support a climate-resilient and prosperous economic future: To provide employment opportunities to communities, capacity building and technical assistance can fund local residents and organizations to partner on program design and outreach. However, there can be barriers to doing so within existing state contracting processes.
- Foster interagency coordination: Capacity building and technical assistance investments can help improve interagency coordination by connecting program participants with multiple agencies and funding sources. For example, SGC's Technical Assistance program offers application assistance for multiple California Climate Investments programs. CARB's Funding Guidelines for Agencies Administering California Climate Investments states that agencies can use program funding to provide technical assistance.⁴⁸ There are limited non-GGRF funding sources dedicated to capacity building.

Flexible grants for plan implementation and community-identified projects

Flexible grants to implement plans or support community-based organizations, governmental entities, or other local partnerships provide funding to invest in a variety of projects depending on what the community has identified and prioritized. SGC's Transformative Climate Communities implementation grants, CARB's Sustainable Transportation Equity

⁴⁸ Available at: https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/2018-funding-guidelines.pdf?_ga=2.111789574.388750369.1621261662-1328961515.1612366904.

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Project and Community Air Protection Incentives programs, and the California Natural Resources Agency's Regional Forest and Fire Capacity program provide funding that allows communities to select and fund the specific projects that are responsive to their needs. For example, the Community Air Protection Incentives provision for community-identified projects is designed to implement projects that address air quality challenges that communities identify through community steering committees, consistent with the framework of AB 617 (C. Garcia, Chapter 136, Statutes of 2017).

Investments in flexible grants for plan implementation and community-identified projects can support the guiding principles by:

- Support implementation of state climate goals: Flexible funding pots can support a wide variety of project types. By incorporating community knowledge to address climate impacts, these grants can help ensure that projects are well-suited to their location. The diverse partnership infrastructure between community organizations, local and regional governments, business, and other entities needed to implement these grants can provide a framework for innovation and catalyze additional projects in the future.
- Advance equity and environmental justice: Investments in flexible grants for plan implementation and community-identified projects advance equity by ensuring that investments are designed to meet community needs.
- Improve public health: The public health benefits from these investments varies depending on the projects identified. The partnership infrastructure and civic participation associated with implementing these grants can address social determinants of health by advancing social cohesion.
- Support a climate-resilient and prosperous economic future: To provide employment opportunities to communities, programs that offer flexible grants can fund local residents and organizations to administer the grants and plan for and conduct outreach. However, there can be barriers to doing so within existing state contracting processes. The projects communities may choose to fund can deliver a wide range of economic benefits including cost savings and resiliency to climate impacts.
- Foster interagency coordination: Flexible funding pots can be designed to build on investments with capacity building, technical assistance, and planning efforts. There are limited non-GGRF sources of flexible funding that communities can use for climate projects.

High-quality jobs and high road workforce development

Creating and supporting high-quality jobs is a core economic benefit of climate project development. California Climate Investments projects interact with labor markets both by directly employing people for project development, implementation, and maintenance and by increasing access for priority populations to employment opportunities through funding for workforce development programs. California Climate Investments programs that provide funding for job training and workforce development include programs that are primarily workforce development programs, including the Low Carbon Economy Workforce Program and the California Conservation Corps' Job Training and Workforce Development Program, and also programs that incorporate workforce development as a component of their programs including the California Department of Community Services and Development's Low-Income Weatherization Program, the California High-Speed Rail Project, and CAL FIRE's Forest Health Program.

The state has invested in new, innovative models to advance economic and workforce objectives. For example, the California Workforce Development Board has initiated work with state agencies to integrate industry- and occupation-specific job quality and job access standards in major climate programs, including but not limited to California Climate Investments programs. Outside of California Climate Investments, CalVolunteer's California Climate Action Corps program is increasing pathways into and participation in the climate workforce by fostering professional development opportunities for Corps members.

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- Support implementation of state climate goals: Addressing the labor market change associated with transitioning to a carbon-neutral economy is a core component of achieving state climate goals. Job training and workforce development activities that focus on these sectoral shifts can help ensure a skilled workforce exists to carry out climate change projects, improve the quality of work performed, and help expand the scope of workers and industries involved in addressing climate change.
- Advance equity and environmental justice: Well-designed workforce development programs that link training and supportive services with high-quality employment opportunities can improve the economic mobility of priority populations and other populations that may face employment barriers. These investments, including a focus on job quality and job access, are also part of providing a just transition to a low-carbon economy.
- Improve public health: Providing high-quality employment opportunities addresses a core social determinant of health. Establishing minimum job quality standards across the portfolio can help ensure that more investment types are providing these benefits. Workforce development programs can also help to improve worker health and safety.
- Support a climate-resilient and prosperous economic future: High road workforce development activities provide significant opportunities to advance high-quality employment in sectors with strong labor market outcomes and improve job quality in industry sectors where low job quality prevails, providing meaningful economic development benefits for individuals and communities. Furthermore, the emphasis on building industry sector-based training partnerships (between employers, workers, unions, community, education and training providers, social service providers, and other entities) helps to develop a lasting skills-building infrastructure that supports community economic resilience. High road workforce programs can also help businesses and industry sectors increase competitiveness through several mechanisms such as reducing inefficiencies, raising productivity, and generating cost savings.
- Foster interagency coordination: Agencies implementing emissions reduction projects can partner with agencies implementing workforce development programs to integrate high road approaches to training and career placement into more investment types. State agencies may also explore opportunities to leverage volunteerism or service-based employment opportunities. The state and federal governments have invested heavily in workforce development. GGRF-funded activities can build on and complement these investments to ensure workforce development programs incorporate new skills and knowledge needed to support long-term climate goals.

Planning and needs assessments

Grants for planning and needs assessments play an important role in building community capacity, establishing local and regional partnerships, identifying community-specific gaps and investment opportunities, and preparing communities to implement a range of projects, including mitigation and adaptation. Collaborative planning efforts that center community organizations and residents are particularly important for achieving equitable processes and outcomes. Several California Climate Investments programs have supported planning and needs assessments, including CARB's Clean Mobility Options, Sustainable Transportation Equity Project, and Community Air Protection Implementation programs, the California Coastal Commission's Coastal Resilience Planning Program, the State Coastal Conservancy's Climate Ready Program, the San Francisco Bay Conservation and Development Commission, the State Water Boards Safe and Affordable Drinking Water program, the Wildlife Conservation Board's Climate Adaptation and Resiliency Program, and SGC's Transformative Climate Communities program.

- Support implementation of state climate goals: Investments in planning and needs assessment can improve the efficacy of project implementation by ensuring that projects are aligned with community needs and have considered the broader context before they are developed. These investments can directly support implementation of state or regional efforts at the local level, like Sustainable Communities Strategies to achieve regional GHG reduction goals associated with SB 375.
- Advance equity and environmental justice: Investing in planning prior to project development can help local partners proactively plan for and mitigate potential unintended consequences from project implementation, such as planning for displacement prevention.

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- Improve public health: The public health benefits from these investments vary depending on the projects identified and ultimately implemented. The partnership infrastructure and civic participation associated with developing a plan and administering a planning grant can address social determinants of health by advancing social cohesion.
- Support a climate-resilient and prosperous economic future: Planning funds can help improve climate resiliency by providing communities with the opportunity to plan for future climate risks such as sea level rise or wildfire. Investments can also provide employment opportunities by funding partners that administer plan development.
- Foster interagency coordination: Planning provides an important vehicle for identifying opportunities for alignment of outreach and funding opportunities across programs. There are limited non-GGRF sources of funding for planning and needs assessments for climate activities.

Program evaluation

Program evaluation is important to improve the effectiveness of climate incentive programs. Some California Climate Investments have funded contracts to evaluate the results of their programs, including CARB's Sustainable Transportation Equity Project and Clean Mobility Options program and SGC's Transformative Climate Communities and Technical Assistance programs. In many cases, estimating the specific effects of individual climate projects can be challenging, and expending substantial program evaluation resources may not necessarily provide illuminating results. However, providing dedicated funds for appropriate levels of program evaluation, particularly with respect to evaluating outreach processes and understanding the benefits from project implementation, can help establish a continuous improvement model within state programs.

- Support implementation of state climate goals: Program evaluation can help to evaluate progress towards climate goals and program objectives to support improved implementation.
- Advance equity and environmental justice: One key area for enhanced program evaluation involves helping to determine who benefits from programs to achieve more equitable outcomes from disproportionately burdened communities. For example, understanding how program benefits vary based on race, gender identity, ability, and other factors can help programs identify whether changes are needed to deliver more equitable outcomes.
- Improve public health: Program evaluation can help agencies understand the public health benefits from programs and whether they are targeted in a way that aligns with public health vulnerabilities, providing opportunities to tailor programs to further improve public health.
- Support a climate-resilient and prosperous economic future: Similarly, program evaluation that provides additional insight into how programs interact with local economic conditions and provide economic benefits can help the state advance a funding portfolio that focuses investments in sectors or locations to maximize these benefits.
- Foster interagency coordination: Program evaluation plays an important role in identifying best practices to promote across programs. There is limited dedicated funding for program evaluation, but agencies can use a portion of their GGRF funding to conduct evaluations.

Research

Several California Climate Investments programs have funded research including SGC's Climate Change Research Program, CALFIRE's Forest Health Research Program, and the California Environmental Protection Agency's Transition to a Carbon-Neutral Economy program.

- Support implementation of state climate goals: Research plays a key role in identifying new emissions reduction strategies and understanding the effectiveness of existing practices to inform program development and implementation. Establishing a mechanism to align research needs with emerging challenges facing state agencies and communities is important to ensure that research projects are policy relevant.

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- Advance equity and environmental justice: Research can help identify areas with disparate impacts. Additional opportunities exist to advance equity through participatory research that directly involves community organizations in the selection of research priorities and the conducting of research.
- Improve public health: Research investments do not directly improve public health but can uncover connections between pollution and public health and new opportunities to achieve public health benefits.
- Support a climate-resilient and prosperous economic future: Research funding can support employment opportunities at research institutions and through partnerships with community-based organizations, governments, and other partners.
- Foster interagency coordination: There are multiple funding sources for research, including non-GGRF state funds, foundations, federal dollars, and others. GGRF-funded research should be tailored to policy-relevant questions that can improve the state's climate incentive programs or other climate strategies.

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Summary of Results

Table 5 summarizes the results of the analysis to enable quick review of key opportunities for each investment type or metric. The table is designed to provide a snapshot of the key takeaways from the analysis, which highlights potential opportunities based on reported data, external research, and stakeholder input. However, it does not capture the nuances in the above analysis. Additionally, not all projects under a particular investment type will necessarily produce the identified benefits, and project-level benefits will vary depending on the specific project components. The results may change over time as programs modify implementation or new data become available.

The table includes rows for each investment type and columns for each metric. The table includes an “X” for a given metric if the analysis concluded that the investment type has the potential to provide benefits associated with that metric. The bullet list below provides additional specificity on what an “X” indicates on the table:

- ZEVs: Can support zero-emission vehicles, equipment, or infrastructure.
- Early-stage: Can support early-stage technology, demonstration projects, or evaluation.
- VMT: Can reduce VMT or provides flexible transportation options.
- Energy savings: Can reduces fuel or electricity consumption.
- Renewable energy: Generates renewable fuel or electricity.
- NWL: Can contribute to state goals to conserve, restore, or sustainably manage natural and working lands.
- Waste: Reduces waste sent to landfills.
- GHGs: Has a GHG cost-effectiveness below \$75/ton of carbon dioxide equivalent reduced or sequestered based on California Climate Investments reported data as of November 30, 2020.⁴⁹
- Priority populations: Has benefited priority populations with at least 70 percent of implemented funds, based on California Climate Investments reported data as of November 30, 2020.⁵⁰
- Community: Supports access to information, community participation and leadership, local and regional partnerships, and shared decision-making.
- Social: Can address social determinants of health.
- Criteria pollutants: Can reduce criteria air pollutant emissions.
- DPM: Can reduce diesel PM emissions.
- Outdoors: Can promote and support opportunities for recreation access and/or physical activity.
- Heat: Can reduce health risk from extreme heat.
- Food: Can increase access to food.
- Cost savings: Can provide energy or travel cost savings.
- Resiliency: Can reduce risk from and increase resiliency to climate impacts.
- Direct jobs: Agencies implementing the investment type have reported direct jobs to California Climate Investments, or the investment type provides job training.
- Coordination: Investment type presents opportunities for coordination across agencies and/or integration of other emissions reduction strategies.
- Limited funding: GGRF continues to play an important role in state funding for the investment type based on availability of non-GGRF funding sources, scale of investment need, or other factors.

For the supporting and cross-sectoral investments, the analysis did not estimate priority population benefits, public health, or cost saving benefits because the benefits vary significantly depending on the specific program or project type being implemented.

⁴⁹ \$75/ton of carbon dioxide equivalent reduced or sequestered is the approximate average GHG cost-effectiveness for projects that reported on GHG emissions as of November 30, 2020. This calculation excludes funding and future GHG reductions from implementation of the High-Speed Rail Project, funding associated with projects that facilitate GHG reductions but may not directly reduce GHG emissions, and administrative expenses.

⁵⁰ 70 percent is the approximate average percentage of funds reported as benefiting priority populations as of November 30, 2020. This calculation excludes funding for the High-Speed Rail Project and from Intermediary Administrative Expenses.

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Table 5. Summary of Analysis of Investment Types by Sector

Investment Type	ZEVs	Early-stage	VMT	Energy savings	Renewable energy	NWL	Waste	GHGs	Priority populations	Community	Social	Criteria pollutants	DPM	Outdoors	Heat	Food	Cost Savings	Resiliency	Direct jobs	Coordination	Limited funding
Sustainable Transportation and Communities																					
Active transportation			X	X					X			X		X			X		X	X	X
Affordable housing development			X	X	X				X	X	X	X	X				X		X	X	X
Shared mobility services	X		X						X		X	X	X	X			X		X	X	X
Transit services	X		X	X	X			X	X		X	X	X	X			X		X	X	
Zero-emission vehicles, equipment, and infrastructure	X	X		X					X			X	X				X		X	X	X
Low Carbon Energy, Buildings, and Industry																					
Advanced technology for back-up power		X			X							X	X					X			X
Building electrification		X		X								X					X			X	X
Building material and construction		X		X		X						X								X	
Refrigerant emissions reductions		X		X				X													X
Energy efficiency and renewable energy (residential)				X	X			X	X			X			X		X	X	X		
Energy efficiency and renewable energy (commercial)				X	X							X					X	X			
Industrial emissions reductions		X		X	X				X			X					X	X	X		X
Woodstove replacement								X	X			X								X	X
Natural and Working Lands																					
Conservation easement			X	X		X		X				X	X		X		X	X	X		X
Forest restoration and management					X	X	X	X				X						X	X	X	X
Soil health on-farm field management practices		X				X						X				X	X	X		X	X
Urban and community forestry and greening				X	X	X	X		X		X	X		X	X		X	X	X	X	X

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Investment Type	ZEVs	Early-stage	VMT	Energy savings	Renewable energy	NWL	Waste	GHGs	Priority populations	Community	Social	Criteria pollutants	DPM	Outdoors	Heat	Food	Cost Savings	Resiliency	Direct jobs	Coordination	Limited funding
Wetland, meadow, and coastal restoration and management						X		X				X		X				X			X
Livestock																					
Anaerobic digestion of dairy manure				X	X			X					X						X		X
Alternative manure management						X		X				X									X
Enteric fermentation reductions		X																		X	X
Waste Diversion																					
Anaerobic digestion of municipal waste					X		X	X	X			X				X			X	X	X
Compost production						X	X	X	X	X	X	X				X			X	X	X
Food rescue and waste prevention							X	X	X	X	X	X				X	X		X	X	X
Recycling infrastructure							X	X				X							X	X	X
Water																					
Energy efficiency for agricultural irrigation				X		X						X	X			X	X				
Energy-saving water-consuming appliances				X				X				X					X		X		
Supporting and Cross-Sectoral																					
Capacity building & technical assistance										X									X	X	X
Flexible funding										X									X	X	X
Job training and workforce development											X								X	X	
Planning and needs assessments										X									X	X	X
Program evaluation		X								X											X
Research		X								X									X	X	X