Bay Area Air District

CLEAN AIR FOR ALL

Appendix D

Frontline Communities Impacts Analysis

March 2026

Bay Area Regional Climate Action Plan

BARCAP Frontline Communities Potential Impacts Report

Overview

This Frontline Communities Potential Impacts report examines and describes how greenhouse gas (GHG) reduction measures can result in meaningful environmental, economic, and social benefits to communities historically burdened by environmental inequities, as well as potential unintended consequences, largely depending on how measures and actions are implemented. The report does not provide a comprehensive analysis of potential impacts or outcomes. Instead, it is intended to flag key issues for consideration prior to initiating implementation of the Bay Area Regional Climate Action Plan (BARCAP) and point to established processes and tactics to support the realization of beneficial outcomes for frontline communities.

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Methodology

This report, and all findings and recommendations included, were developed through desktop research of relevant studies, research, and case studies, and incorporates input from the Bay Area Air District and frontline community members to reflect local best practices and priorities. The list of Potential Impacts of GHG Emission Reduction Measures to Frontline Communities in the following section, which includes the main categories and key examples for each measure, served as a foundation for this research and informed the evaluations of potential impacts on frontline communities discussed in the Measure descriptions in the main BARCAP document. Along with identifying potential benefits and unintended consequences of actions, this report describes steps that can be taken to prevent or reduce negative impacts, such as through the use of appropriate technical, policy, and engagement approaches during implementation.

Potential Impacts of GHG Emission Reduction Measures to Frontline Communities

Informed by the information from this report, Air District staff worked with Cascadia to assess BARCAP measures using the impact categories listed below, which were originally identified during the development of the Priority Climate Action Plan (or "PCAP," which was the first phase of the EPA's Climate Pollution Reduction Grant). At that time, the impact categories were reviewed and refined by the PCAP "Roundtable"[1] that was created for that plan.

Generally, BARCAP measures are designed to reduce GHG emissions and maximize the potential for meaningful community benefits across key areas ("impact categories"). However, they can also result in unintended consequences leading to undesirable outcomes, largely depending on how the measures are implemented. The impact categories are used to identify and inform potential benefits and potential unintended consequences for each proposed measure. The intention of this work is to ensure BARCAP measures can support frontline communities while also identifying how potential disbenefits and unintended consequences of these measures can be mitigated.

Potential benefits and potential unintended consequences have been summarized and sorted into seven main impact categories: housing quality and security; public and community health; jobs and workforce development; community engagement, awareness, and capacity; transportation access and costs; climate resilience co-benefits; and energy costs and burden. These categories are aligned with:

- Priorities identified through a review of recently completed community engagement from previously adopted local climate action plans.

[1] See Air District's 2024 Priority Climate Action Plan, page 5 for a description of the Roundtable.

- Priorities voiced by a Roundtable of community-serving organizations with deep familiarity with frontline communities in the eight counties.
- EPA's guidance document.

In the table below, examples are shown of potential benefits and potential unintended consequences of climate actions across each impact category.

Impact Categories	Examples of Potential Community Benefits	Examples of Potential Unintended Consequences
Housing Quality and Security	• Improved housing conditions, increased comfort, protection from extreme heat and cold • Reduced utility bills and maintenance costs	• Potential for increased housing costs, displacement risk, rent increases, and gentrification
Public and Community Health	• Reduced exposure to health-damaging pollution (with public health benefits) • New green spaces and community gardens • Decreased safety risks	• Inequitable distribution of benefits for just the wealthy, those in non-overburdened communities
Jobs and Workforce Development	• Post training employment • Better pay • Benefits • Sustained work • Job security	• Reduced work and lack of training and other supportive resources for those in older, carbon-intensive industries
Community Engagement, Awareness, and Capacity	• Increased community awareness of solutions/projects and results • Community capacity building (including to participate in climate solutions and help bring those solutions to their communities) • Improved or growing trust between communities and the government	• Outreach may only engage people in one area, one language, or those with more time and resources, and omit many individuals with possibly greater vulnerabilities • Non-inclusive implementation planning • Lack of time and opportunity for working families to engage • Reduced trust in government and technologies
Climate Resilience Co-benefits	• Increased resiliency to climate-related impacts	• Only available to those with higher incomes and access to resources

Impact Categories	Examples of Potential Community Benefits	Examples of Potential Unintended Consequences
Cost Burdens	• Decreased energy cost burden • Increased energy security	• Increased energy costs, less money for rent and food

Transportation

Equitable transportation is integral to ensure equal access to places of employment, business, recreation, learning, and residence. Strategies like facilitating the use of micromobility options (e.g. bicycles, electric bikes, scooters), electrifying on-road vehicles, and reducing vehicle miles traveled can decrease local air pollution near major transportation corridors and improve public health in frontline communities. The recommendations described below aim to ensure frontline communities equitably benefit from the shift to decarbonized transportation and an expanded and inclusive transit system, while preventing additional harm.

T-1: Accelerate Light-Duty Electric Vehicle Adoption

T-1.1: Expand incentives for the purchase or lease of electric vehicles (EVs)

T-1.2: Provide monetary and non-monetary incentives to deploy EV charging stations at strategic locations to help fill gaps in the existing charging network

T-1.3: Partner with community organizations to provide community outreach, awareness, and technical support for low-income households and small business/nonprofits in navigating incentives

T-1.4: Expand support for local governments in developing and implementing policies that help accelerate the transition to EVs, such as zoning and building code updates, permit streamlining, and parking and curbside policies

Potential Benefits

PUBLIC HEALTH BENEFITS FROM DECREASED AIR POLLUTION, ENHANCED ENERGY SECURITY, AND DECREASED RELIANCE ON FOSSIL FUELS

Light-duty vehicles, including passenger cars, SUVs, pickup trucks, and motorcycles, are responsible for about half of all U.S. transportation GHG emissions, as reported in the Inventory of U.S. Greenhouse Gas Emissions and Sinks.[1] Enhancing clean and efficient transportation options and optimizing vehicle efficiency can effectively mitigate the adverse impacts of climate change and air pollution. These actions promote a more equitable, accessible, and affordable transportation system, thereby improving all

users' overall quality of life. Additionally, it helps diminish reliance on fossil fuels and enhances energy security.[2]

AFFORDABILITY FOR LOW-INCOME RESIDENTS WHO USE EVs

Incorporating on-site EV car sharing and charging, coupled with suitable discount fare programs, is expected to alleviate energy cost burdens among those who use EVs. This integrated approach ensures affordability for low-income residents, particularly in frontline communities. Beyond the upfront cost barrier associated with acquiring electric vehicles, accessibility of charging stations is recognized as a challenge for EV adoption and usage. Ensuring an equitable deployment of charging infrastructure requires deliberate measures to prioritize underserved communities and align with the expanded provision of EV incentives to various population segments.[3] This shift can reduce the overall cost burdens associated with EV usage in these communities. PG&E offers an Electric Home Rate Plan for homes with EVs, which can save customers money if they shift usage, such as car charging, to lower-priced times of day.[4]

Recommendations to ensure this potential benefit is realized for frontline communities:

- Subsidize purchasing and leasing by expanding rebates, tax credits, or voucher programs, specifically for low-income drivers. This could be modeled after California's Clean Vehicle Rebate Project (CVRP) Low-Income Incentive Program. Implementers must ensure simplified application processes and multilingual support to reduce participation barriers.
- Site EV charging infrastructure in or near multifamily affordable housing. Implementers should partner with utilities and local governments to install charging stations in or adjacent to multifamily dwellings. This could be modeled after the Bay Area Air District's *Charge!* Program which provides grant funding to offset costs associated with purchasing and installing publicly accessible and multi-family housing EV chargers.[5]

T-2: Accelerate Medium-and Heavy-Duty Vehicle and Equipment Decarbonization

T-2.1: Expand incentives and loan assistance for the purchase of medium- and heavy-duty zero-emission (ZE) vehicles and equipment

T-2.2: Encourage large fleets (e.g., municipal, transit, or corporate fleets) to serve as anchor tenants for charging and clean-fuel fueling hubs

T-2.3: Develop and disseminate technical design guidance for fleets on how to right-size charging infrastructure

Potential Benefits

DECREASED AIR POLLUTION NEAR TRANSPORTATION ROUTES

According to the U.S. Department of Energy, nationwide, medium- and heavy-duty vehicles (MHDVs) are the second-largest contributor to transportation GHG emissions, at 21% of all emissions.[6] This diverse category of vehicles includes larger pickup trucks, delivery and work vans, refuse collection vehicles, buses, and heavy trucks. These actions could collectively reduce localized air pollution near roadways and transit routes, deliver public health benefits, and ensure that the communities historically most burdened by transportation emissions are among the first to experience cleaner, healthier environments.

California Air Resources Board (CARB) has set a goal to eliminate emissions from public buses by 2040, which transit authorities across California have already begun to achieve by decarbonizing their fleets.[7] [8] [9] However, decarbonizing other types of MHDVs and equipment such as diesel trucks will be important to realize health benefits in frontline communities residing near major freight routes and facilities, such as ports. For example, the American Lung Association found in 2020 that diesel trucks, while making up just six percent of vehicles in the U.S., were responsible for a disproportionate 31 percent of nitrogen oxides (NO_x) and 55 percent of particulate matter pollution.[10] According to CARB, zero emission (ZE) trucks and equipment can improve high air pollution conditions from freight traffic around ports and docks.[11]

Recommendation to ensure these air quality and health benefits are realized for frontline communities:

- Encourage public and private MHDV fleet owners to deploy ZE vehicles in frontline communities first (e.g., people living in areas designated as Low-Income and Disadvantaged Communities (LIDACs))**.** For example, when creating their Clean Corridors Plan, Alameda Contra Costa Transit District reviewed which Disadvantaged Communities are in the service areas prioritized for ZE bus deployment to inform decision making.[12]

Potential Unintended Consequences

INCREASED AIR POLLUTION NEAR ELECTRICITY GENERATING UNITS

Net increases in electricity demand associated with increased vehicle electrification can result in increased $PM_{2.5}$ emissions in areas near electric generating units (EGUs, i.e. power plants) that use fossil fuels. When modeling electrification measures in Los Angeles County, significant health impacts from increased $PM_{2.5}$ emissions by fossil fuel-based EGUs were likely to be experienced in other areas across the state, up to and including those within the Bay Area.[13] In areas where the public fleet has not fully transitioned to zero emissions, transit hubs, especially in frontline communities, may also experience short-term increases in air pollution burden despite the long-term benefits of improvements in public health, energy consumption, and cost savings that will later result from a full transition. However, an assessment in 2022 by the National Bureau of Economic Research found that the positive environmental benefits of urban bus electrification outweigh the damages associated with increased emissions from fossil fuel-based EGUs across all counties in the United States.[14]

T-3: Accelerate Decarbonization of Goods Movement

T-3.1: Pilot policies that expedite the transition to ZE last-mile delivery for goods to identify feasibility and best practices

T-3.2: Explore regulatory and non-regulatory approaches to incentivize or mandate ZE trucks and off-road mobile operations at truck-attracting businesses, such as warehouses

Potential Benefits

DECREASED AIR POLLUTION

Zero emission (ZE) last-mile delivery trucks reduce diesel and gasoline emissions, which disproportionately affect neighborhoods near major delivery hubs, distribution centers, and high-traffic corridors, are often cited in or nearby frontline communities.[15] [16] [17] Reduced exposure to $PM_{2.5}$, NO_x, and black carbon can lower rates of asthma, cardiovascular disease, and other respiratory conditions.[18]

Recommendation to ensure this potential benefit is realized in frontline communities:

- Transportation agencies and organizations should create and implement inclusive and accessible public input opportunities and participatory processes so residents of frontline communities can provide direct input on where ZE infrastructure is placed, which goods delivery routes are prioritized, and ensure equal distribution of benefits is a key consideration that is community informed.

JOB ACCESS AND WORKFORCE OPPORTUNITIES

Pilot programs could create training and hiring opportunities for local residents to maintain, operate, and manage ZE delivery fleets. Targeted programs could ensure frontline community residents benefit from new employment in logistics and green vehicle operations.

REDUCED TOTAL COST OF OWNERSHIP FOR FLEET OWNERS

Electric vehicles (EVs) have the potential to offer fleets lower total cost of ownership (TCO) compared to diesel vehicles. While EVs require higher upfront costs to procure vehicles and install the necessary electric vehicle supply equipment (EVSE), EVs also provide reduced operating and fuel costs per PG&E's Fleet Savings calculator and resources.[19]

Potential Unintended Consequences

POTENTIAL COST PASS-THROUGHS TO LOW-INCOME HOUSEHOLDS

Zero-emission (ZE) vehicles often have higher upfront costs to purchase or lease.[20] If small businesses who are transitioning to ZE fleets pass these costs on to consumers, low-income households could face indirect price increases for goods delivery.

Recommendation to ensure this potential unintended consequence is minimized:

- Subsidize the transition to ZE fleets in frontline communities. Pilot programs should include subsidies, grants, or low-interest loans to prevent ZE fleet transition costs from being passed on to customers. ZE truck mandates could be paired with programs that provide financial support or phased compliance schedules for businesses operating in or serving frontline communities. Non-regulatory incentives (e.g., grants, rebates, preferential contracts) for ZE fleet transitions could prioritize vendors or operators based in or that particularly serve frontline communities.

T-4: Support Implementation of Plan Bay Area 2050+

T-4.1: Support alternatives to driving along through land use, transit, biking, and walking strategies identified in Plan Bay Area 2050+

Potential Benefits and Unintended Consequences

See Plan Bay Area 2050+ Draft Equity Analysis Report for more information.

Buildings

Equitable implementation of Building sector measures offers significant opportunities to improve outcomes for frontline communities. Potential benefits include improving indoor and outdoor air quality, increasing occupant comfort and resilience to climate change impacts, and enabling long term energy savings. Supporting the implementation of the zero-NO_x building appliance rules through targeted outreach, education and engagement, and technical and financial resources − particularly for frontline communities − will ensure everyone can benefit from the transition to healthy, zero emission homes and cleaner air for all.

B-1: Support Implementation of the Air District's Zero-NO_x Building Appliances Rules by Addressing Key Opportunities and Challenges

B-1.1: Leverage partnerships and coordinate with key supply chain entities to develop a suite of activities to increase zero-NO_x appliance awareness and adoption to support high-levels of compliance and equipment performance

B-1.2: Support policy development efforts and disseminate best practices that streamline permitting for heat pump installations and promote electrification readiness in Bay Area jurisdictions

B-1.3: Promote and increase awareness of low-power appliance options and other panel optimization strategies with multi-language communications that will help people avoid unnecessary electrical service upgrades

B-1.4: Explore new funding and financing opportunities to augment existing sources to further reduce financial burdens, especially for low-income building owners and tenants

B-1.5: Develop and deliver culturally competent and multilingual information, outreach and marketing campaign about the zero-NO_x building appliance rules, focusing on low-income and overburdened homeowners and renters, and multifamily building owners

B-1.6: Expand engagement with affordable multifamily housing owners (deed-restricted and naturally-occurring) to address technical, financial, and community challenges related to zero-NO_x appliance rules, and co-develop solutions to ensure owners get the resources and support they need so residents and owners benefit from the transition to clean appliances

B-1.7: Provide education regarding best practices for those that choose to self-install heat pump water heaters (i.e. Do-It-Yourself'ers, or DIY'ers)

B-1.8: Collaborate with Northwestern Energy Efficiency Alliance (NEEA) and others to support the development and piloting of split-system heat pump water heaters that can address constrained space installation challenges for Rule 9-6

Potential Benefits

REDUCED EXPOSURE TO NATURAL GAS COMBUSTION BYPRODUCTS THAT HARM PUBLIC HEALTH

The health benefits of building electrification (installing electric instead of natural gas appliances) and building envelope improvements accrue from reductions in exposure to natural gas combustion byproducts, such as $PM_{2.5}$.[21] [22]

Recommendation to ensure this potential benefit is realized for frontline communities:

- Combine weatherization and building efficiency programs that typically target low-income and frontline communities with residential building electrification incentives to support multiple health, air quality, and climate co-benefits by mitigating harmful air pollutants and methane emissions in those communities.[23]

EQUITY BENEFITS

As described above, building electrification and efficiency measures can mitigate the potential harms of increased air pollution caused by appliances that combust natural gas; these benefits are particularly important for frontline communities already overburdened by air pollution who are often low-income and communities of color who live in close proximity to significant sources of air pollution like ports, freeways, and indus[24]

Recommendations to ensure these benefits are realized by those who need them the most:

- Establish a community work group that includes community-based organizations (CBOs), community members, and other partners to advise on and participate in implementation planning so that their needs and priorities – technical, financial, and cultural – are heard and considered. This can be done by setting aside time and resources for local governments, implementation partners (such as incentive programs) and CBOs to co-develop implementation solutions together. This recommendation is supported by SAJE's Decarbonizing CA Equitably report, which recommends that policy makers do the following:
  - Seek out perspectives from tenant advocates, legal service providers, and low-income tenants.
  - Solicit insights into the specific hardships encountered by tenants, particularly those involving landlord harassment, displacement due to construction, rent burden, and eviction.
  - Prioritize active listening to hear how tenants are currently affected by the affordable housing crisis, and whether and how they believe decarbonization efforts will compound those effects.
  - Acknowledge their contributions by providing appropriate compensation for their valuable time and input.
  - Develop relationships with CBOs to leverage existing relationships and connect with community members.[25]
- Prioritize and operationalize housing security and anti-displacement best practices in the implementation of electrification and efficiency programs. Local governments, CBOs, and other key stakeholders like rental property owners, tenant groups, and legal service providers should leverage policy and implementation best practices and work together to address implementation barriers as they emerge. These implementation considerations for building decarbonization programs could follow a methodology developed in 2021 by the Building Decarbonization Coalition with UC Berkeley to provide protection against rent increases and prevent potential displacement impacts.[26]
- Guarantee that measure implementation includes health and safety upgrades to address health issues from lead, asbestos, and mold.[27]

REGIONAL AIR QUALITY IMPROVEMENT

The Bay Area Air District found that installing zero-NO_X-emitting appliances could prevent up to 85 premature deaths per year, lower $PM_{2.5}$ exposure, and avoid up to $890 million per year in health impacts due to air pollution exposure.[28] These appliances reduce pollutants that are vented outdoors, including those from natural gas appliances. A statewide study found that, under a 2018 scenario where all residential gas appliances in CA were transitioned to electric, the reduction of secondary nitrate $PM_{2.5}$ (from NO_X) and primary $PM_{2.5}$ would result in 354 fewer deaths, and 596 and 304 fewer cases of acute and chronic bronchitis, respectively. The reduction in associated negative health effects is equivalent to approximately $3.5 billion in monetized health benefits for just one year.[29]

B-2: Advance Decarbonization and Public Health Goals by Integrating Electrification Incentives with Home Repair and Weatherization Services and Other Non-Energy Programs Targeted Toward Low-Income and Frontline Communities

B-2.1: Explore new funding and financing opportunities for home repair, public health, energy efficiency, and decarbonization programs to augment existing sources

B-2.2: Make home decarbonization retrofits more affordable and accessible through coordinated efforts to use all capital and programmatic options

B-2.3: Partner with PG&E to map ideal locations for decommissioning, work with counties to coordinate and conduct outreach

B-2.4: Pilot a mini-BACHI retrofit program that combines home repair, energy efficiency and decarbonization services and incentives

B-2.5: Based on lessons learned from pilot (B-2.4), secure funding to expand the mini-BACHI pilot retrofit program to all Bay Area counties with a focus on partnering with affordable housing programs and owners to identify sites and project opportunities

Potential Benefits

UPFRONT COSTS WILL RESULT IN LONG-TERM SAVINGS AND RETURN-ON-INVESTMENT

Financial incentive programs that support electrification upgrades for low-income households reduce upfront cost barriers and can unlock ongoing, long-term utility cost savings as well. In a study from Richmond, CA, building envelope and electrification upgrades resulted in reduced annual utility bill costs for modeled buildings that resulted in a 100%+ return on investment for upfront costs.[30] PG&E's Electric

Home Rate Plan ("E-Elec" rate) for homes with EVs, electric heat pumps, or battery storage make electric appliances more affordable to operate. Specifically, low-income families who are at 200% to 250% of Federal Poverty Guidelines may opt into qualified electric rate discount programs (CARE and FERA, respectively), which reduce overall electricity bill costs and make operating heat pumps much more affordable.[31] Other plans can save large electricity-using customers money if they shift their usage to lower-priced times of day.[32]

Recommendations to ensure this potential benefit is realized:

- Continue to promote and raise awareness about available cost-saving program opportunities that are specifically targeted to lower-income households, such as those offered by BayREN, community choice aggregators, utilities, and the state (TECH Clean CA, Equitable Building Decarbonization programs).
- Continue to promote the E-Elec rate to households that electrify their appliances, and CARE and FERA low-income electricity discount rate plans to lower income families who qualify for them.

ELECTRIFICATION AND ENERGY EFFICIENCY RETROFITS (LIKE WEATHERIZATION) CAN PROTECT OCCUPANTS FROM CLIMATE-RELATED HAZARDS SUCH AS EXTREME HEAT AND WILDFIRE SMOKE

Because electric heat pumps provide mechanical cooling in addition to space heating, they increase comfort and safety of homes during extreme heat events that will increase with climate change. Other physical upgrades to buildings that can save energy and increase comfort, such as insulating, air sealing, and weatherizing building envelopes also serve to protect occupants from extreme air pollution events such as those caused by wildfires. [33]

Potential Unintended Consequences

INCREASED COST BURDEN AND DISPLACEMENT RISK

Studies have found correlations between certain energy improvements and increased cost burdens.[34] Today, there is some incremental cost increase for homeowners to install electric heat pumps over like-for-like gas appliances, which can be partially or totally offset by financial incentives but their future funding availability is uncertain. For renters, portions of the costs that landlords pay for appliance electrification could be passed on to tenants, which could result in rent burden increases for low-income renters. Furthermore, landlords may be able to use construction projects (noise, dust, and hazards that make tenants feel pressured to leave voluntarily) to displace long-term tenants to see a quicker return on investment or capitalize on the value-add to their properties from modern electric appliances.[35]

Some statewide policy interventions, such as AB 1482, include an exception that allows landlords to evict tenants if they plan to remodel the unit for more than 30 days and it is unsafe for the tenant to stay. Building decarbonization retrofits, which may take months to complete, could lead to evictions under this loophole.[36]

Recommendations to mitigate these potential unintended consequences:

- Establish rent increase and eviction prohibitions and "right-to-return" provisions (for tenants who may be required to relocate for construction purposes) in incentive programs, and set tenant pass-through limits for electrification retrofits.

- Help property owners manage upfront costs by developing and directing programs offering financial incentives, direct installations, and low-cost financing to those with lower incomes residing in frontline communities.

INCREASED ELECTRICITY BILLS

California's electricity prices are among the highest in the nation, reducing the savings that households in frontline communities may attain from electrifying their homes (e.g., by installing electric heat pumps) especially in certain utility territories.[37] However, research from RMI finds there can still be net financial benefits for switching to electric heat pump appliances for households, especially for those that leverage the specialized electric rates ("E-Elec rate") that heat pump customers can choose.[38] Similarly, electricity rate discount programs, such as CARE and FERA, are available for low-income electricity customers meeting certain income levels (i.e. Federal Poverty Guidelines).

Recommendation to mitigate this potential unintended consequence:

- Publicize and conduct outreach and education regarding the E-Elec rate plan (for market rate utility customers) and CARE/FERA electricity plans (for qualifying low-income customers) that will help manage electricity bill costs for households switching to electric zero-NO_X heat pump appliances.

B-3: Support Collaborations and Partnerships to Ensure the Building Decarbonization Workforce is Successful, Skilled, and Diverse Enough to Serve the Entire Region Effectively and in a Culturally Competent Manner

B-3.1: Highlight and promote contractors who hold established certifications and credentials that indicate they are skilled and knowledgeable about heat pumps, and partner with incentive program administrators and other organizations to communicate their value proposition for customers

B-3.2: Explore funding opportunities and partnerships to expand education, training, business growth and other targeted support of Minority/ Women/ Disadvantaged Business Enterprises (MWDBE) contracting companies to become active in building decarbonization program and project opportunities

B-3.3: Explore the creation of a contractor mentorship program that leverages the experiences and knowledge of high-performing heat pump installers ("volume installers") to share information and tips that explain the business opportunity to gas-centric contractors so they get interested in electric heat pump upskilling and training opportunities

B-3.4: Assemble a regional information-sharing network/directory to increase awareness and opportunities for contracting businesses to connect with training providers and new workers who have demonstrated a commitment to pursuing a career in the field. Integrate information about project and funding opportunities, requests for proposals, and incentive program updates as appropriate

Potential Benefits

POTENTIAL FOR NEW JOBS TO BE WELL-PAID AND BENEFITED, ALLOWING FOR IMPROVED QUALITY OF LIFE FOR SOME FRONTLINE COMMUNITIES

The 2023 Equitable Electrification Analysis for Existing Buildings in Richmond, CA showed that 75% of private industry construction workers nation-wide had access to employer-sponsored health care benefits, 81% had access to paid vacation benefits, 69% had access to paid sick leave, and 63% had access to retirement benefits plans.[39]

Through strategic policies, such as establishing minimum workforce standards in funding programs, agencies can raise the bar for the level of skill and training of workers and support good paying workforce development in emerging industries like residential building electrification.[40]

Recommendations to ensure this potential benefit is realized for frontline communities:

- Highlight local workforce training programs for electricians, plumbers, and other decarbonization-related roles, particularly those that target workers from frontline communities, formerly incarcerated people, and people with other barriers to employment.

- Seek to develop and implement regionally consistent workforce standards for retrofit projects to increase the number of family-sustaining and good paying jobs.

- Provide streamlined support for contractors from and that serve frontline communities e.g., increase awareness of and access to incentives, improve communication tools with customers.

These recommendations align with those put forward by UCLA researchers to create conditions that attract skilled workers, pre-qualify contractors, support the up-skilling of workers through stackable credentials, and structure the work to create opportunities for frontline workers.[41]

MORE JOB POTENTIAL IN ELECTRIFICATION AND EFFICIENCY THAN FOSSIL-FUEL BASED COUNTERPARTS

Low-carbon energy technologies can create more jobs per unit of energy than their coal and natural gas counterparts.[42]

An analysis of potential employment impacts of CA building electrification (assuming the state electrified all buildings by 2045) projected the following changes:

- 59k-100k new jobs from construction, annually 2020-2045

- 3k-5k new from manufacturing, annually 2020-2045

- 10k-12k new jobs from electricity generation and distribution by 2045

- 7k-14k fewer jobs from gas distribution by 2045[43]

Three out of five jobs required to meet CA's building electrification goals would be in “high-road” sectors. The right set of policy interventions can reform the competitive dynamics in traditionally “low-road” industries like residential and small commercial construction to improve the quality of jobs and engage more highly skilled workers.[44]

Recommendation to ensure this potential benefit is realized:

- Include labor and workforce development agencies in program design and build workforce transition into program budgets. A Greenlining Institute report recommends the above to ensure that current low-income fossil fuel workers have access to and training for electrification job opportunities.[45]

Power

An equitable and affordable transition to clean energy generation and storage in the Bay Area has the potential to provide a multitude of benefits for frontline communities, including potential bill savings and increased energy resilience. Ensuring access to and direct benefits from programs, technologies, and resources for frontline communities, including low-income and moderate-low-income households and multi-family renters, will require careful implementation and additional funding resources.

P-1: Increase Development of Local Clean Energy and Storage Projects (with a Focus on Projects up to 20MW), Including Behind-the-Meter and Distributed Energy Resources

P-1.1: Support local governments to promote and incentivize development of clean energy projects on preferred sites in their jurisdiction that are well-suited for small- to medium-scale clean energy development and have community and business support

P-1.2: Develop a roadmap for community solar and brownfield-to-brightfield projects, especially projects serving multi-family renters and frontline communities, and identify options to fund and pilot projects at key sites

P-1.3: Identify and disseminate best practices for local governments to simplify permitting of clean energy and storage projects

P-1.4: Monitor - and explore how to address - key funding and financing gaps for behind-the-meter and in front-of-the-meter small clean energy and storage projects that benefit frontline communities, low-income and moderate-low-income households, small businesses, and community organizations

Potential Benefits

LOWER ENERGY BILLS AND REVENUE GENERATION FOR LOW-INCOME HOUSEHOLDS FROM DISTRIBUTED/ON-SITE AND COMMUNITY PROJECTS

Behind-the-meter and small front-of-the-meter clean energy projects, including community solar, can offer bill savings and revenue generation for owners and subscribers. For example, rooftop solar or community-sited solar owners can receive bill credits as compensation for excess electricity generation that is exported to the grid.[46] Similarly, community solar projects provide bill credits to subscribers based on the amount of electricity produced by their share of the project. Community solar subscribers in certain markets save 5-15% on their monthly electricity bill. [47] California's statewide Community Renewable Energy Program, established by AB 2316 in 2024 once approved by the CPUC, is required to

reserve 51% of its capacity for low-income customers.[48] This minimum low-income household participation requirement is higher than any other state besides New Jersey. As federal tax incentives for clean energy projects are withdrawn, funding/financing gaps for behind-the-meter and in small front-of-the meter clean energy projects may widen, making them increasingly unavailable for frontline communities and low-income households, businesses, and community-based organizations (CBOs). Focusing on supporting local clean energy and storage projects can help mitigate this impact and ensure frontline communities receive the benefits of lower energy bills.

Recommendations to ensure this potential benefit is realized:

- Use equity criteria in project siting and design by using equity mapping tools to prioritize sites located in or near frontline communities, aligning with CalEnviroScreen, others identified in the BARCAP Frontline Communities Map, and community-identified priority areas.[49] Project developers could prioritize community solar projects that serve multi-family housing, especially deed-restricted affordable housing.

- Local governments and utilities should engage and co-develop programs with frontline communities and CBOs and fund inclusive community engagement processes—such as multilingual meetings, trusted local facilitators, and stipends for community participation—to ensure siting reflects local preferences.

STRENGTHENED REGIONAL GRID RESILIENCE

Increasing the number of local clean energy and storage projects can prevent power outages that disproportionately impact low-income households and increase the affordability gap in California.[50] Grid reliability (reduction in total duration of interruptions and total number of interruptions for a group of customers) could also improve. Strengthened regional grid resilience is particularly important as low-income households may struggle to afford energy resilience solutions like backup generators and may face higher energy burdens, making them more susceptible to the impacts of outages, like spoiled food or inability to use medical devices/refrigerate medications. Cumulative effects of repeated outages can hinder economic advancement and perpetuate cycles of poverty.

LOCAL JOB CREATION POTENTIAL

Local clean energy and storage projects could benefit low-income and frontline jobseekers, if programs are designed well. According to Clean Jobs California 2024, the state had 544,604 clean energy jobs at the end of 2023, with rapid growth in sectors such as energy efficiency, renewable generation, and storage/grid modernization.[51] The solar + storage industry has shown strong “local job-intensity”, with industry estimating that every megawatt of local solar creates 60 full-time jobs, many local, in installation, maintenance, and related trades.[52]

Recommendations to ensure this potential benefit is realized:

- Create or promote targeted workforce development programs and apprenticeships. Project officials should partner with unions, community colleges, Tribes, and workforce boards to develop training/apprenticeship programs in solar, storage, microgrids, and grid modernization with a specific focus on low-income, BIPOC, and displaced fossil-fuel workers.

- Include stipends, wrap-around support (e.g., childcare, transportation), and direct placement pipelines. For instance, in 2021 during solar installation on Santa Rosa Tribal lands, residents participated in paid job training, gaining hands-on experience in solar energy systems as part of CSD's Community Solar Pilot.[53] The Clean Power Alliance offers a number of green workforce training programs, such as a solar and storage microgrid maintenance training for residents of underserved communities in Los Angeles County.[54] In 2022, the first training cohort enrolled 35 students, with 26 graduating and 15 placed in internships.

- Promote small business and contractor inclusion by exploring set-aside funding or technical assistance for minority- and women-owned contractors to compete for clean energy project bids, building capacity for long-term participation in the sector.

- Include or develop models of Community Benefits Agreements (CBAs) for large energy projects. Model CBAs are developed for larger utility-owned projects to guarantee frontline communities receive tangible outcomes (e.g., access to discounted energy, job training, community investment funds). The WINDExchange database includes examples of wind projects in California that offered CBAs.[55] The Great Plains Institute has compiled resources on CBAs for solar projects.[56]

IMPROVED LOCAL AIR QUALITY AND PUBLIC HEALTH FROM GREENING THE GRID

Retiring fossil fuel power generation (e.g., coal, oil, gas), especially near Bay Area and other California communities disproportionately burdened by air pollution, could improve local air pollution and reduce negative health impacts, such as reduction of pre-term births. A study in the American Journal of Epidemiology by Casey et al. analyzed birth data from 2001 to 2011 and found that the closure of eight coal and oil power plants in California was associated with a significant decrease in preterm birth rates among nearby residents. The proportion of preterm births within 5 km of the plants was reduced from 7.0% to 5.1%, and within 5–10 km, it decreased from 6.6% to 5.5%. The reduction was more pronounced among non-Hispanic Black and Asian mothers.[57]

P-2: Equitably Expand Customer Programs and Deploy Power System and Grid Technologies More Widely

P-2.1: Increase the number of critical public facilities with reliable clean backup power and key community facilities with clean resilient energy resources (e.g., solar+storage, microgrids), such as resilience hubs, in coordination with local government emergency response managers and plans. In some cases, solar+storage hybrid may be necessary depending on the end use

P-2.2: Accelerate scaling up of different load flexibility solutions across the region in an equitable manner to improve grid reliability, help control costs, and align with state load shift goals to shift electricity usage

P-2.3: Explore mechanisms to minimize or eliminate health risks from fossil fuel-based backup generation (BUG) for large commercial facilities in ways that maximize the GHG co-benefits

P-2.4: Modernize transmission and distribution lines to increase efficiency and improve reliability (e.g., grid-enhancing technologies, reconductoring)

Potential Benefits

ENERGY RESILIENCE DURING CRISES

Microgrids with renewable energy resources (like the Calistoga Resiliency Center in Napa, which has solar + battery + hydrogen fuel cells) can power connected facilities during grid outages or Public Safety Power Shutoff (PSPS) events, replacing diesel-based back-up generators and bolstering emergency response.[58] While PSPS may reduce the risk of wildfires and associated hazards of flames/heat, smoke, and water contamination, there are also risks associated with the loss of electricity, such as disruptions of school or work activities and the inability to power critical medical equipment. CalMatters' reporting in 2019 revealed that low-income households can face hunger and financial crisis when blackouts/PSPS events cause refrigerated food to spoil.[59] Microgrids that can work independently of the grid ensure resilience during crisis and mitigate the impacts of blackouts/PSPS events, particularly in frontline communities.

REDUCED EMISSIONS AND MITIGATED HEALTH IMPACTS OF POWER OUTAGES AND SHUT-OFFS

Without electricity, households lose access to air conditioning or heating, which is critical during heat waves or cold snaps. Frontline community households are more likely to live in poorly insulated or densely packed housing, which exacerbates temperature extremes. Clean back-up power can help prevent heat stress, medication spoilage, and service interruptions. Clean back-up power sources also reduce reliance on diesel generators and peaker plants, which is especially beneficial in communities historically overburdened by air pollution.

Recommendation to ensure the potential benefit is realized:

- Prioritize siting of resilience hubs in frontline communities by building on work by state agencies and local advocates like the Greenbelt Alliance's Bay Area Resilience Hotspots initiative.[60] It is important to locate resilience hubs in frontline communities, ensuring access to essential services in climate-driven outages.

ENERGY COST SAVINGS FOR CUSTOMERS

Time-of-Use (TOU) rates and demand response (DR) can lower costs if households are able to shift their electricity usage to designated lower rate periods. However, some DR programs cater only to specific devices, installers, or manufacturers. This may exclude households with older and/or more affordable

technologies even if they would otherwise be able to participate from a technical standpoint. Furthermore, while TOU rates may be beneficial for low-income households that can modify their energy use, they can create financial burdens for others: A 2017 Statewide Opt-In TOU Pricing Pilot evaluation highlighted the risks of TOU rates on California Alternate Rates for Energy and/or the federal Family Electric Rate Assistance (CARE/FERA) households and the need for safeguards for participants.[61] Other groups identified in the pilot as not achieving cost savings from DR programs include households in hot climates where air conditioning is critical or those with inflexible work/life schedules.

Recommendations to ensure this potential benefit is realized for frontline communities:

- Utilities should continue to provide and expand measures such as baseline allowances, bill protection, smart thermostat rebates, and other accommodations to help customers who are low-income or medical baseline (those who depend on power for their medical needs) adjust their behavior and manage costs related TOU rates or when they opt to participate in DR programs. Minimizing potential negative rate impacts on medical baseline customers and others who cannot readily shift their usage is critical. Programs should ensure some level of flexibility so that customers in these situations are still able to prioritize their own resilience needs, e.g., by opting out of a particular event or adjusting the minimum reserve level of their battery without unreasonable penalties.

- Continue to incentivize solar and storage with rebates for low-income households but encourage, rather than mandate, their participation in DR programs to be eligible for these rebates. Utilities and CCAs offer a range of solar and storage rebates for income-qualified customers. For example, CPUC's Self-Generation Incentive Program (SGIP) provides significant incentives which can fully cover solar and battery systems for eligible low-income customers. SGIP and Residential Solar and Storage Equity (RSSE) programs have required participation in DR programs from low-income customers as a prerequisite for receiving rebate funds.[62] However, Center for Sustainable Energy, the program administrator in the San Diego region, notes in a 2025 CPUC filing that there are no CPUC-approved programs available to low-income households who are customers of Community Choice Aggregators, which affected their participation in SGIP. This and other challenges are noted in the filing.[63] Educating households about the benefits of participation and encouraging enrollment when appropriate rather than mandating participation preserves energy choice.

Waste

Equitable implementation of Waste section measures and actions offers major opportunities to reduce greenhouse gas (GHG) emissions, divert waste and compost contamination, and protect communities impacted by industrial scale composting facilities as California works toward its organic waste diversion and food recovery goals. Strategies like asset sharing, participatory planning, and education around food and building life cycles reduce pollution, create economic dividends, and improve environmental safety. The recommendations provided aim to find equitable solutions to reduce or divert waste while preventing additional environmental harm to frontline communities.

W-1: Enable Food Access and Clean Compost

W-1.1: Develop funding and asset-sharing mechanisms to support edible food recovery operations

W-1.2: Coordinate regional efforts to improve sorting of organics discards, including reducing common contaminants of the organics stream

W-1.3: Increase the region's understanding of lifecycle and health impacts of food and goods consumption and the opportunity for community-scale solutions

Potential Benefits

FOOD SECURITY AND HEALTHIER FOOD SYSTEMS

There is an opportunity to advance food security and create healthier food systems in the Bay Area while reducing GHG emissions by expanding the capacity of food banks, mutual aid networks, and community-based organizations, particularly those serving frontline communities, to redistribute surplus nutritious food from recovery operations. Senate Bill 1383 mandates that local jurisdictions recover 20% of edible food otherwise headed to landfills to feed food insecure individuals and aims to reduce organic waste by 75%.[64]

Bay Area residents are spending almost $100 more a month on groceries than they were pre-pandemic.[65] Those higher costs strain monthly budgets and force families to choose cheap foods over healthy ones. These problems are disproportionately affecting people in frontline communities such as East Oakland, a neighborhood that is primarily composed of low-income families of color. According to the 2024 California Health Interview Survey, about 1 in 10 adults in East Oakland neighborhoods experience food insecurity, twice as many people than in most other parts of the city.[66] Coordinated regional efforts to improve organics sorting and reduce contamination can also improve working conditions in waste and compost operations and increase the availability of high-quality compost for urban agriculture and community gardens, supporting local food production and access to fresh produce in neighborhoods with limited healthy food options.

Recommendation to ensure this potential benefit is realized:

- Create dedicated funding streams for grants and low-cost shared assets for community-based food recovery organizations and food hubs specifically serving frontline communities.

REDUCTION IN COMPOST CONTAMINATION

Compost created from urban waste inputs have a higher concentration of contaminants compared to those from rural areas. This can increase PFAS, lead, pesticides, and herbicides to compost. Hall et al. conclude there is a resultant need for more testing to ensure compost quality.[67] Municipal contracts in places like Seattle and San Francisco include strict guidelines on compost feedstock (acceptable inputs), and require testing for contaminants such as metals, pathogens, and PFAS to ensure safety. These contracts help define what materials can go into compost and ensure traceability.

Recommendations to ensure this potential benefit is realized:

- Create mechanisms to avoid urban compost contamination, including mandating testing compost for metals, pathogens, and PFAS, and specify allowable contaminant levels. Compost performance is highly sensitive to contamination; the presence of plastics and other non-compostable materials can degrade compost quality and increase processing costs. In regions without strong source-separation programs or effective enforcement, poor feedstock quality can threaten the viability of composting facilities.[68] Washington State has implemented policies banning PFAS in food packaging to protect the integrity of compost feedstock. Composting systems that include preventative measures can significantly minimize contamination.

- Ensure equitable education and communication around composting. This includes creating accessibility in education around waste by including multilingual, multimedia communication to educate diverse urban populations on waste sorting, food sovereignty, and health impacts. [69] Radio and health centers can help spread messaging and education.

PARTICIPATORY PLANNING AND COMMUNITY WELL-BEING

Community composters often offer co-benefits such as education, green space, and embeddedness, aligning with public health and social well-being goals. Participatory planning can support both climate change mitigation and local environmental health.[70]

Recommendation to ensure this potential benefit is realized:

- Broaden success metrics for program evaluation. Lifecycle models often exclude social equity and community health outcomes, suggesting a need for broader metrics to evaluate success in community-scale composting systems.[71]

INCREASED EFFICIENCY AND LOW GHG EMISSIONS THROUGH LANDFILL DIVERSION AND FOOD RESCUE

Food rescue has the lowest GHG emissions of all analyzed organic waste strategies, including composting and anaerobic digestion. Improvement of food recovery efforts and infrastructure reduces the need for compost processing facilities and maximizes resource efficiency, especially for edible food still fit for consumption.[72]

DIVERSIFICATION OF COMPOST MECHANISMS

The diversification of composting facility types (small and industrial facilities) and feedstocks supports the needs of communities and provides more opportunities to reduce costs and reduce emissions. Smaller scale community composters, often operated by nonprofits, offer social co-benefits such as food security, education, and local employment.[73]

Potential Unintended Consequences

COMPOSTING FACILITY SITING TRADE-OFFS

Urban areas like the Bay Area have the most access to organic waste sources, but very few suitable sites for compost facilities. Composting is most useful when hauled to agricultural and pastoral areas (e.g., San Joaquin Valley), however these areas are often identified as frontline communities and the most impacted by poor air quality. An increase in composting facilities poses a public health risk as facilities can contribute to an increase in air pollution in frontline communities. Already, over 35% of composting facilities are currently located in disadvantaged communities within California.[74] This highlights a significant tradeoff: prioritizing environmental justice can reduce negative air quality impacts but may limit access to agricultural compost markets (Harrison et al., 2024).

Recommendations to ensure this potential unintended consequence is minimized:

- Utilize or create smaller composting facilities, like neighborhood-scale composting sites[75]
- Decentralize and diversify composting infrastructure and focus on reducing the number of large, commercial-scale facilities near frontline communities.

W-2: Support Low-Carbon Building Materials and Reuse

W-2.1: Collaborate with the state and other local governments to implement the California Green Building (CALGreen) and CARB embodied carbon code requirements

W-2.2: Work with construction project teams and suppliers to increase availability and adoption of low-carbon building materials and practices

W-2.3: Conduct local assessments to identify opportunities for the region's existing buildings

Potential Benefits

GREENER, HEALTHIER BUILDINGS (INCLUDING AFFORDABLE HOUSING)

California's adoption of the first state-mandated green building code in the U.S., CALGreen Code, will require all new construction or significant renovations to meet environmental and public health standards.[76] Many low-carbon materials are less toxic (e.g., low-VOC), which can reduce respiratory issues and other health problems. According to EPA, households with poor housing quality had 50 percent higher odds of an asthma-related ED visit in the prior year.[77] Green homes result in 47% fewer sick building syndrome symptoms.[78]

Frontline community populations, often exposed to higher environmental health burdens, stand to benefit from these changes, but may not be able to afford to live in new housing units built to code. However, Low-Income Housing Tax Credit (LIHTC) policy modifications are integrating green standards into new affordable housing.[79]

Recommendation to ensure this potential benefit is realized:

- Improve buildings chemical testing standards. 70% of chemicals from building material are not currently covered in indoor air quality testing standards. Chemicals that are covered in testing are not considered in the threshold to be protective from asthma onset. Oregon's Department of Environmental Quality recommends improving testing considerations for additional chemicals related to indoor building materials.[80] [81]

REDUCED EXPOSURE TO DEMOLITION IMPACTS

Material reuse encourages deconstruction rather than demolition, which generates less dustfall and noise. This improves local air quality and livability, especially important in dense or already overburdened.[82]

Recommendations to ensure this potential benefit is realized:

- Municipalities should create safe building demolition ordinances. Portland, OR was the first city to pass a residential deconstruction ordinance in 2016 to promote safer demolition of homes (built pre-1916), reducing lead/asbestos exposure and salvaging materials for reuse. These kinds of ordinances support circular economies and minimize waste from buildings. Deconstruction ordinances also help support safer demolition and minimize poor air quality for workers and the surrounding community.

- Protect the construction workforce from harmful exposure through strengthened labor standards, education, and awareness. Construction workers experience higher exposure to harmful chemicals from building materials, which they could be exposed to when reusing building materials. These include asbestos, silica, and mold.

Potential Unintended Consequences

HIGHER UPFRONT COSTS OF LOW-CARBON SUSTAINABLE MATERIALS

Some low-carbon materials or deconstruction practices may have higher upfront costs. Without subsidies or incentives, this could increase construction costs and be passed on to renters or buyers, worsening housing affordability.

W-3: Reduce Methane Emissions from Waste Management Facilities

W-3.1: Explore rulemaking to minimize emissions of methane, volatile and toxic organic compounds, and odorous substances from organic waste handling facilities, including large composting facilities

Potential Benefits

LANDFILL DIVERSION

Smaller industrial facilities (20,000 t/year) are recommended in urban centers to lower transport costs and emissions, and they can be more feasibly co-located with food recovery or processing operations. Incorporating additional community-scale composting like those in Los Angeles County is cited as capable of processing the equivalent of 25 full-scale facilities—these decentralized systems can share assets like land, equipment, and labor across multiple small sites.[83]

Recommendation to ensure this potential benefit is realized:

- Minimize air pollution and avoid siting composting facilities in/near the residential portion of frontline communities. Transportation emissions can increase significantly if regional systems are not well-optimized, especially for low-density areas where compost or food must travel far.[84] Composting facilities increase VOC and NH3 air contaminants posing a greater risk to individuals in disadvantaged communities.[85]

Natural and Working Lands (NWL)

Equitable conservation and management of natural habitats, farms and ranchlands, wetlands, recreation areas, and urban green spaces, collectively referred to as Natural and Working Lands (NWL), can offer significant opportunities to reduce climate vulnerability and deliver co-benefits to frontline communities. Strategies like wildfire fuel reduction, urban greening, and habitat restoration can reduce air pollution, improve mental and physical health, enhance community safety, and provide workforce opportunities. When led by or in partnership with frontline communities, these actions can also restore cultural connection to land and further environmental justice efforts.

NWL-1: Accelerate Implementation of Nature-Based Solutions through Regional Funding and Data Analysis

NWL-1.1: Provide technical assistance for NWL data analysis to support project implementation, results tracking, and incorporation of emerging science

NWL-1.2: Increase long-term funding for nature-based solutions through dedicated support for regional-scale grant writing and exploration of emergent sources of long-term funding

Potential Benefits:

IMPROVED EQUITY AND TRANSPARENCY IN PLANNING

The City of Oakland's Urban Forest Plan uses CalEnviroScreen and localized tree canopy data to identify priority investment areas in frontline neighborhoods like East and West Oakland.[86] Riley and Gardiner et al. (2020) highlight how spatial tools can link canopy and ecosystem service access with race, renter status, and other social vulnerability factors.[87]

Recommendations to ensure this potential benefit is realized:

- Ensure tool accessibility and equity by translating and localizing planning tools, e.g., California Protected Areas Database (e.g., multilingual, mobile-friendly, visual).[88]
- Support community-led data collection by providing stipends, training, and funding to support CBO-led data collection and frameworks.[89]

DATA INTEGRATION FOR INFORMED IMPLEMENTATION

Southern California Association of Governments (SCAG) combined heat exposure and social vulnerability data to identify neighborhoods in need of immediate cooling and resilience interventions in their *Extreme Heat & Public Health Report*.[90]

Recommendation to ensure the potential benefit is realized:

- Integrate different local and regional data sets, such as health, housing burden, and EJ metrics and others, into planning process and for decision making.

IMPROVED ACCESS TO NATURED-BASED FUNDING AND TOOLS

The San Francisco Estuary Partnership and Thompson et al. (2023) stress that complex grant applications often exclude frontline CBOs.[91] [92] They highlight the need for long-term, flexible grant models to enable CBOs to participate in nature-based solutions without being overwhelmed by administrative barriers. Providing grant writing, funding exploration, and technical assistance support can improve access to nature-based funding and tools in the BARCAP region.

Recommendation to ensure this potential benefit is realized:

- Undertake grantmaking reform and fund capacity-building grants that support frontline-led planning and participation in programs such as the Metropolitan Transportation Commission's Priority Conservation Area Grants.[93] While such programs have advanced equity-centered project design, federal support for efforts explicitly framed around equity or environmental justice may be increasingly constrained, highlighting the importance of diversified and state-level funding strategies.

Potential Unintended Consequences:

DATA GAPS IN FRONTLINE COMMUNITIES

Indicators like urban tree canopy coverage may oversimplify frontline needs. For example, a report by the Los Angeles Urban Forest Equity Collective noted that two neighborhoods may each report 20% canopy coverage, but the lived experience can differ dramatically depending on how that canopy is distributed.[94] In a well-resourced neighborhood, trees may be evenly spaced to provide widespread shade along streets, bus stops, and homes. In contrast, a frontline neighborhood may have that same 20% canopy concentrated in a single park or private space—offering little relief to most residents. These contextual differences are critical but often missed in aggregated data. Additionally, community engagement processes may oversample higher-income or more digitally connected residents, skewing priorities and outcomes.[95]

IMPLEMENTATION RISKS IN BUILDING REGIONAL CAPACITY

While regional capacity-building offers long-term benefits, smaller cities, land trusts, Tribes, and CBOs in frontline areas may face structural limitations that hinder participation. These may include the absence of a dedicated data/GIS analyst, a staff grant writer, or personnel with climate science expertise—posing a barrier to accessing and applying regional tools and funding (California Strategic Growth Council, 2023; CLEE, 2023).[96]

Recommendation to ensure this potential unintended consequence is minimized:

- Make funding flexible by offering sustained, low-barrier grant options for frontline groups. Additionally, funders can provide free technical assistance with grant-writing.[97]

NWL-2: Prevent Losses of Carbon Held in NWL through Land Conservation, Wildfire Management, and Ecosystem Restoration

NWL-2.1: Support conservation of lands at the regional scale through the Priority Conservation Area (PCA) Program

NWL-2.2: Increase fuel management and reduce wildfire risk on natural and working lands and at the wildland-urban-interface (WUI) through new funding and financing mechanisms, workforce development, and innovation

NWL-2.3: Incentivize private landowners managing large land areas to manage fuel at scale through innovations in cost sharing and financing

NWL-2.4: Protect carbon held in the Bay Area's wetlands through protection, restoration, and enhancement of tidal marsh habitat

NWL-2.5: Contribute to emergent science on blue carbon through research on blue carbon fluxes and beneficial sediment reuse

NWL-2.6: Support efforts to protect riparian forests, advancing land and water management strategies that maintain and increase carbon storage

Potential Benefits:

CLIMATE RESILIENCE THROUGH ECOSYSTEM CONSERVATION AND RESTORATION

Herrera (2022) and Dybala et al. (2018) show that wetland and riparian restoration buffer sea level rise, reduce flood risk, and improve water quality in low-income communities.[98] [99] These projects also offer biodiversity and recreational co-benefits that promote mental health and ecosystem access.

Recommendation to ensure this potential benefit is realized:

- Promote risk-responsive restoration by targeting wetland and riparian investments to communities facing sea level rise, flooding, drought, or water contamination risks. Specifically, municipalities/subareas seeking to comply with the Bay Area's Regional Shoreline Adaptation Plan sea level rise planning requirement should look to green infrastructure and coastal wetland restoration strategies.

HEALTH PROTECTION FROM FIRE AND SMOKE

D'Evelyn et al. (2022) highlight how prescribed fire and Indigenous fire stewardship reduce wildfire smoke exposure for frontline communities.[100] Proactive fire management can lessen health burdens in

high-risk zones, but it must be accompanied by smoke-ready infrastructure and equitable communication to ensure benefits are realized.

TRIBAL STEWARDSHIP AND CO-MANAGEMENT

Centering Tribal-led practices builds long-term ecological and cultural resilience. Herrera (2022) emphasizes the role of Indigenous leadership in restoring wetlands and shared land governance.[101]

Recommendation to ensure this potential benefit is realized:

- Invite frontline and tribal groups to co-lead solutions development and implementation, ensuring co-governance of fire and restoration projects by Native Nations and local CBOs.[100][102][103] Furthermore, land managers can engage and compensate Tribal Elders to integrate cultural burning and Traditional Ecological Knowledge into programs, and Tribal youth to preserve/promote continuity of cultural heritage.

Potential Unintended Consequences:

HEALTH RISKS FOR FIRE SAFETY WORKERS

Wildfire fuel management, particularly at the wildland–urban interface (WUI), is a multi-agency effort involving CAL FIRE, the U.S. Forest Service, local fire departments, and private landowners. Managing fuel at WUI can reduce property damage, improve fire suppression efficiency, and lower long-term suppression costs—primarily benefiting landowners.[104] However, the physical risks fall on fire safety workers, many of whom are underpaid, overexposed, or part of marginalized labor groups, including incarcerated individuals and migrant crews. Historically, wildfires have disproportionately impacted low-income communities in California, while the benefits of fuel management often accrue to better-resourced homeowners and landowners.[105]

Recommendation to ensure this potential unintended consequence is minimized:

- Develop workforce and stewardship programs. Restoration projects create jobs in wildfire mitigation, ecological restoration, and riparian enhancement. However, these jobs vary greatly in quality. The Putting California on the High Road report flags that vegetation management and fire prevention work often suffer from “low-road” labor conditions—low pay, dangerous conditions, and limited upward mobility—particularly for migrant workers, H-2B visa holders, and formerly incarcerated individuals.[106]

AFFORDABLE HOUSING AND DISPLACEMENT RISKS

Conservation efforts may raise property values and restrict housing supply.[107]

Recommendation to ensure this potential unintended consequence is minimized:

- Institute anti-displacement safeguards by pairing land conservation with tenant protections, land trusts, and housing equity strategies.

IMPACTS ON LOCAL AIR QUALITY

Prescribed burns nearby low-income or Tribal communities impact local air quality and may escape containment. This could harm residents if proper notice is not given or a burn plan with appropriate safety procedures and smoke management is not created (e.g. via official Air District procedures).

Recommendation to ensure this potential unintended consequence is minimized:

- Create smoke preparedness infrastructure such as clean air shelters, distribute resources like portable air filters, and issue accessible multilingual alerts.[108]

NWL-3: Enhance Carbon Sequestration and Reduce Greenhouse Gas Emissions through Management and Restoration of Agricultural and Working Lands

NWL-3.1: Scale climate-beneficial agriculture and catalyze widespread adoption of practices that increase or maintain above- and below-ground carbon stocks, and achieve climate resilience on working lands

NWL-3.2: Increase local implementer capacity by conducting a regional needs assessment and 'shovel-worthy' project portfolio

NWL-3.3: Support integration of climate-beneficial agriculture into climate-related plans and policies through a planning toolkit and training

NWL-3.4: Explore establishment of more renewable energy on agricultural lands

NWL-3.5: Reduce energy-related emissions and increase groundwater recharge through adoption of sustainable water management practices

Potential Benefits:

ENVIRONMENTAL HEALTH AND SOIL RESILIENCE

Fernandez-Bou et al. (2023) finds that repurposing cropland near frontline areas can reduce pesticide drift, nitrate runoff, and groundwater overdraft.[109] Healthy soils and buffers also enhance carbon sequestration and flood resilience.

WORKFORCE AND ECONOMIC TRANSITION

Lewis and Rudnick (2019) emphasize that regenerative agricultural practices can create higher-wage, lower-pollution jobs.[110] These include composting, food processing, and carbon farming—co-benefits that support immigrant and rural workforce development. Additionally, climate-beneficial farming practices can reduce ground-level temperatures by improving soil moisture and adding vegetative cover.

These benefits may lessen heat exposure for farmworkers, but risks remain without access to shade, water, and rest—especially in hotter inland regions.[111] [112]

Recommendation to ensure these potential benefits are realized:

- Train and transition the workforce by using regenerative agriculture and nature-based solution projects as sites for workforce transitions particularly for rural, BIPOC, and frontline workers moving from hazardous industries to restoration and clean industry roles.[113] [114]

WATER AND FOOD SECURITY

State Water Efficiency and Enhancement Program (SWEEP)-supported irrigation practices and community gardens strengthen resilience to drought and increase fresh food access.

Recommendation to ensure this potential benefit is realized:

- Prioritize access-first program design by simplifying SWEEP/Healthy Soils applications by removing matching fund barriers for small and socially disadvantaged farmers.[115]

Potential Unintended Consequences:

URBAN AGRICULTURE AND GENTRIFICATION

While urban agriculture can increase food access and build social ties, it can also contribute to gentrification when framed through a "green lifestyle" lens (e.g., boutique urban farms). Projects must be carefully designed to prevent displacement and include frontline participation (Alkon and Cadji, 2018).

Recommendation to ensure this potential unintended consequence is minimized:

- Support culturally-rooted farms. Fernandez-Bou et al. (2023) emphasizes the need to protect Southeast Asian and Indigenous farms during land transitions through technical and financial support.[116]

URBAN AGRICULTURE AND FOOD SOVEREIGNTY

Urban agriculture supports cultural identity, traditional foodways, and food access in BIPOC communities. It also contributes to climate resilience and local food systems.[117] However, most urban growers lack secure land tenure, making them vulnerable to displacement when land is redeveloped or leases expire.

Recommendation to ensure this potential unintended consequence is minimized:

- Secure land tenure and protect growers. This can be done by supporting policies like long-term leases, land trusts, and public land allocation to ensure BIPOC-led urban agriculture projects can thrive without risk of displacement.[118]

CAPACITY AND EQUITY RISKS FOR SMALL AND FRONTLINE FARMERS

Application barriers, match funding requirements, and administrative complexity continue to limit access for small and socially disadvantaged farmers.[119] Repurposing farmland may displace culturally significant small farms without equity safeguards.[120]

GROUNDWATER RECHARGE IMPACTS

Drip irrigation can reduce groundwater recharge, exacerbating inequities in regions with poor water access.

Recommendation to ensure this potential unintended consequence is minimized:

- Pair irrigation with recharge, ensuring that drip irrigation upgrades are paired with aquifer recharge to avoid unintended water access inequities.

NWL-4: Expand and Maintain Urban Green Spaces While Advancing Environmental Justice Outcomes

NWL-4.1: Expand urban green spaces and prevent loss through new regional funding and technical support, prioritizing green spaces that benefit frontline communities

NWL-4.2: Advance environmental justice-centered approaches for urban greening through policy innovation, community-led planning, and support for frontline community land stewardship

Potential Benefits:

IMPROVED HEALTH AND COOLING

The City of Oakland (2024) and SCAG (2020) link urban greening to reduced asthma, urban heat island mitigation, and improved mental health, especially in redlined neighborhoods with limited access to parks and trees.[121] [122] Semeraro et al. (2021) note green spaces support stress relief and social cohesion, particularly in redlined areas.[123]

Recommendation to ensure this potential benefit is realized:

- Prioritize urban green space maintenance in frontline communities. This can be achieved by funding proactive tree maintenance and sidewalk repair in underinvested neighborhoods. Massachusetts's Greening the Gateway Cities provides one example of how to structure a multi-city program focused Environmental Justice communities which encourages and compensates residents participating in tree planting and maintenance.[124]

COMMUNITY STEWARDSHIP AND ECONOMIC INCLUSION

The *Environmental Justice 2.0* report highlights how greening projects offer job pathways for youth, formerly incarcerated people, and long-term residents.[125]

Recommendation to ensure this potential benefit is realized:

- Prioritize local jobs and access by supporting green workforce development for youth and residents with barriers to employment.

Additionally, community design ensures that green infrastructure reflects cultural values and needs.[126]

Recommendation to ensure this potential benefit is realized:

- Utilize culturally responsive design for green infrastructure. Renters, seniors, and frontline workers must be involved in site selection, species choice, and programming to ensure projects reflect their interests and traditions.[127]

NEIGHBORHOOD LIVABILITY AND CONNECTIVITY

Well-maintained green spaces support social ties, pedestrian access, and community cohesion.[128] When tied to "right tree/right place" strategies, they can improve transit comfort and walkability.

Potential Unintended Consequences:

UNDER-MAINTENANCE AND DISPLACEMENT RISK

Frontline renters may not benefit equally from greening unless outreach, protection, and access are built into planning.[129] Poor design or under-maintenance of green spaces may lead to allergens, pests, or safety concerns.

Green investments may also drive displacement when not paired with rent protection measures.[130]

Recommendation to ensure this potential unintended consequence is minimized:

- Pair greening and green infrastructure investments with anti-displacement strategies (e.g., land trusts, rent control, affordable housing development).[131] A national study by UCLA and the University of Utah found that early, multi-sector anti-displacement strategies are key to preventing green gentrification alongside major park projects.[132]

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