Bay Area Air District

BOARD OF DIRECTORS
Policy, Grants, and Technology Committee
March 18, 2026

COMMITTEE MEMBERS

VICKI VEENKER – CHAIR
MARGARET ABE-KOGA
BRIAN COLBERT
JOELLE GALLAGHER
RAY MUELLER
LENA TAM

JUAN GONZÁLEZ III – VICE-CHAIR
KEN CARLSON
NOELIA CORZO
RICO MEDINA
MARK SALINAS

MEETING LOCATION(S) FOR IN-PERSON ATTENDANCE BY COUNCIL MEMBERS AND MEMBERS OF THE PUBLIC

Bay Area Metro Center
1st Floor Board Room
375 Beale Street
San Francisco, CA 94105

County of Santa Clara
Board of Supervisor's Office
70 West Hedding Street, 10th Floor
San Jose, CA 95110

Napa County Administration Building
1195 Third Street, Suite 310
County Executive's Office
Napa, CA 94559

Alameda County
Board of Supervisors District 3
101 Callan Ave., Suite 103
San Leandro, CA 94577

San Mateo County
Board of Supervisors Offices
500 County Center, 5th Floor
Redwood City, CA 94063

City of San Bruno
567 El Camino Real, Room 138
San Bruno, CA 94066

THE FOLLOWING STREAMING OPTIONS WILL ALSO BE PROVIDED

These streaming options are provided for convenience only. In the event that streaming connections malfunction for any reason, the Policy, Grants, and Technology Committee reserves the right to conduct the meeting without remote webcast and/or Zoom access.

The public may observe this meeting through the webcast by clicking the link available on the air district's agenda webpage at https://www.baaqmd.gov/bodagendas

Members of the public may participate remotely via Zoom at https://bayareametro.zoom.us/j/83867186360 or may join Zoom by phone by dialing (669) 900-6833 or (408) 638-0968. The Webinar ID for this meeting is: 838 6718 6360

PUBLIC COMMENT ON AGENDA ITEMS

The public may comment on each item on the agenda as the item is taken up. Members of the public who wish to speak on a matter on the agenda will have two minutes each to address the Committee on that agenda item, unless a different time limit is established by the Chair. No speaker who has already spoken on an item will be entitled to speak to that item again.

Written public comments can be emailed to comments@baaqmd.gov or through the Air District's website via the "Submit a Comment" feature for this meeting. Written public comments emailed by 10:00 a.m. on the business day prior to this meeting will be provided to the Committee members in advance of the meeting. Written public comments emailed after that deadline will be provided to the Committee members following the meeting's adjournment. Unless directed by the Chair, written public comments will not be read aloud during the meeting.

The Committee welcomes comments, including criticism, about the policies, procedures, programs, or services of the Air District, or of the acts or omissions of the Committee. Speakers shall not use threatening, profane, or abusive language which disrupts, disturbs, or otherwise impedes the orderly conduct of a Committee meeting. The Air District is committed to maintaining a workplace free of unlawful harassment and is mindful that Air District staff regularly attend Committee meetings. Discriminatory statements or conduct that would potentially violate the Fair Employment and Housing Act – i.e., statements or conduct that is hostile, intimidating, oppressive, or abusive – is *per se* disruptive to a meeting and will not be tolerated.

POLICY, GRANTS, AND TECHNOLOGY COMMITTEE MEETING AGENDA

WEDNESDAY, MARCH 18, 2026
10:00 AM

Chairperson, Vicki Veenker

1. **Call to Order - Roll Call**

   The Committee Chair shall call the meeting to order and the Clerk of the Boards shall take roll of the Committee members.

2. **Pledge of Allegiance**

CONSENT CALENDAR (Item 3)

The Consent Calendar consists of routine items that may be approved together as a group by one action of the Committee. Any Committee member or member of the public may request that an item be removed and considered separately.

3. Approval of the Draft Minutes of the Policy, Grants, and Technology Committee Meeting of February 18, 2026

   The Committee will consider approving the Draft Minutes of the Policy, Grants, and Technology Committee Meeting of February 18, 2026.

ACTION ITEM(S)

4. State Legislative Updates

   The Committee will consider recommending to the Board of Directors that the Board adopt positions on pending state legislative bills where appropriate, including, but not limited to the following Air District staff recommendations:

SUPPORT	***OPPOSE***
Assembly Bill 2313 (Berman)	*Assembly Bill 1791 (Sanchez)*
Senate Bill 299 (Cabaldon)	*Assembly Bill 2752 (Ávila Farías)*
Senate Bill 954 (Blakespear)	*Senate Bill 1392 (Cortese)*

   In addition, the Committee will discuss state legislative updates. This item will be presented by Alan Abbs, Legislative Officer in the Legislative and Government Affairs Division.

INFORMATIONAL ITEM(S)

5. Update on Bay Area Regional Climate Action Plan

The Committee will consider and discuss an update on the Air-District-led Bay Area Regional Climate Action Plan. The Air District received a $1 million grant from the United States Environmental Protection Agency to lead a multi-agency climate planning effort. This item will be presented by Jamesine Rogers Gibson, Senior Advanced Projects Advisor in the Planning and Climate Protection Division.

OTHER BUSINESS

6. Public Comment on Non-Agenda Matters

Pursuant to Government Code Section 54954.3, members of the public who wish to speak on matters not on the agenda will be given an opportunity to address the Committee. Members of the public will have two minutes each to address the Committee, unless a different time limit is established by the Chair. The Committee welcomes comments, including criticism, about the policies, procedures, programs, or services of the Air District, or of the acts or omissions of the Committee. Speakers shall not use threatening, profane, or abusive language which disrupts, disturbs, or otherwise impedes the orderly conduct of a Committee meeting. The Air District is committed to maintaining a workplace free of unlawful harassment and is mindful that Air District staff regularly attend Committee meetings. Discriminatory statements or conduct that would potentially violate the Fair Employment and Housing Act – i.e., statements or conduct that is hostile, intimidating, oppressive, or abusive – is per se disruptive to a meeting and will not be tolerated.

7. Committee Member Comments

Any member of the Committee, or its staff, on their own initiative or in response to questions posed by the public, may: ask a question for clarification, make a brief announcement or report on their own activities, provide a reference to staff regarding factual information, request staff to report back at a subsequent meeting concerning any matter or take action to direct staff to place a matter of business on a future agenda. (Gov't Code § 54954.2)

8. Time and Place of Next Meeting

Wednesday, April 15, 2026, at 10:00 a.m. The meeting will be held in-person at the Bay Area Metro Center and at satellite locations as may be specified on the meeting agenda using a remote teleconferencing link. Members of the Policy, Grants, and Technology Committee and the public may attend at any of those in-person locations, and members of the public may also attend virtually via webcast.

9. Adjournment

The Committee meeting shall be adjourned by the Chair.

CONTACT:
MANAGER, EXECUTIVE OPERATIONS **(415) 749-4941**
375 BEALE STREET, SAN FRANCISCO, CA 94105 **FAX: (415) 928-8560**
vjohnson@baaqmd.gov **Air District homepage:**
www.baaqmd.gov

- Any writing relating to an open session item on this Agenda that is distributed to all, or a majority of all, members of the body less than 72 hours before the meeting shall be made available at the Air District's offices at 375 Beale Street, Suite 600, San Francisco, CA 94105, at the time such writing is made available to all, or a majority of all, members of that body.

Accessibility and Non-Discrimination Policy

The Bay Area Air District (Air District) does not discriminate on the basis of race, national origin, ethnic group identification, ancestry, religion, age, sex, sexual orientation, gender identity, gender expression, color, genetic information, medical condition, or mental or physical disability, or any other attribute or belief protected by law.

It is the Air District's policy to provide fair and equal access to the benefits of a program or activity administered by Air District. The Air District will not tolerate discrimination against any person(s) seeking to participate in, or receive the benefits of, any program or activity offered or conducted by the Air District. Members of the public who believe they or others were unlawfully denied full and equal access to an Air District program or activity may file a discrimination complaint under this policy. This non-discrimination policy also applies to other people or entities affiliated with Air District, including contractors or grantees that the Air District utilizes to provide benefits and services to members of the public.

Auxiliary aids and services including, for example, qualified interpreters and/or listening devices, to individuals who are deaf or hard of hearing, and to other individuals as necessary to ensure effective communication or an equal opportunity to participate fully in the benefits, activities, programs and services will be provided by the Air District in a timely manner and in such a way as to protect the privacy and independence of the individual. Please contact the Non-Discrimination Coordinator identified below at least three days in advance of a meeting so that arrangements can be made accordingly.

If you believe discrimination has occurred with respect to an Air District program or activity, you may contact the Non-Discrimination Coordinator identified below or visit our website at www.baaqmd.gov/accessibility to learn how and where to file a complaint of discrimination.

Questions regarding this Policy should be directed to the Air District's Non-Discrimination Coordinator, Kimberly Leefatt, Civil Rights Officer at 415-749-4610 or by email at non-discriminationcoordinator@baaqmd.gov.

BAY AREA AIR DISTRICT
375 BEALE STREET, SAN FRANCISCO, CA 94105
FOR QUESTIONS PLEASE CALL (415) 749-4941

EXECUTIVE OFFICE:
MONTHLY CALENDAR OF AIR DISTRICT MEETINGS

MARCH 2026

TYPE OF MEETING	DAY	DATE	TIME	ROOM
Advisory Council Meeting	Monday	16	9:00 a.m.	1st Floor, Yerba Buena Room
Board of Directors Policy, Grants and Technology Committee	Wednesday	18	10:00 a.m.	1st Floor Board Room
Board of Directors Finance and Administration Committee	Wednesday	18	1:00 p.m.	1st Floor Board Room
Community Advisory Council Meeting	Thursday	19	6:00 p.m.	Juntos Fruitvale 3357 International Boulevard Oakland, CA 94601

APRIL 2026

TYPE OF MEETING	DAY	DATE	TIME	ROOM
Board of Directors Meeting	Wednesday	1	10:00 a.m.	1st Floor Board Room
Board of Directors Stationary Source Committee	Wednesday	8	10:00 a.m.	1st Floor, Yerba Buena Room
Board of Directors Community Equity, Health, and Justice Committee	Wednesday	8	1:00 p.m.	1st Floor, Yerba Buena Room
Board of Directors Policy, Grants and Technology Committee	Wednesday	15	10:00 a.m.	1st Floor Board Room
Board of Directors Finance and Administration Committee	Wednesday	15	1:00 p.m.	1st Floor Board Room
Board of Directors Special Meeting Budget Hearing	Wednesday	29	10:00 a.m.	1st Floor Board Room
Board of Directors Special Meeting	Wednesday	29	11:00 a.m.	1st Floor Board Room

mv 3/11/26 – 2:05 p.m. G/Board/Executive Office/Moncal

BAY AREA AIR DISTRICT
Memorandum

To: Chairperson Vicki Veenker and Members of the Policy, Grants, and Technology Committee

From: Philip M. Fine
Executive Officer/APCO

Date: March 18, 2026

Re: Approval of the Draft Minutes of the Policy, Grants, and Technology Committee Meeting of February 18, 2026

RECOMMENDED ACTION

Approve the attached Draft Minutes of the Policy, Grants, and Technology Committee Meeting of February 18, 2026.

BACKGROUND

None.

DISCUSSION

Attached for your review and approval are the Draft Minutes of the Policy, Grants, and Technology Committee Meeting of February 18, 2026.

BUDGET CONSIDERATION/FINANCIAL IMPACT

None.

Respectfully submitted,

Philip M. Fine
Executive Officer/APCO

Prepared by: Marcy Hiratzka
Reviewed by: Vanessa Johnson

ATTACHMENT(S):

1. Draft Minutes of the Policy, Grants, and Technology Committee Meeting of February 18, 2026

Bay Area Air District
375 Beale Street, Suite 600
San Francisco, CA 94105
(415) 749-5073

Policy, Grants, and Technology Committee Meeting
Wednesday, February 18, 2026

DRAFT MINUTES

This meeting was webcast, and a video recording is available on the website of the Bay Area Air District at
www.baaqmd.gov/bodagendas

CALL TO ORDER

1. **Opening Comments:** Policy, Grants, and Technology Committee (Committee) Chairperson, Vicki Veenker, called the meeting to order at 10:01 a.m.

   Roll Call:

   Present, In-Person (Bay Area Metro Center (375 Beale Street, 1st Floor Board Room, San Francisco, California, 94105): Committee Chairperson Vicki Veenker; Vice Chair González; Director Ken Carlson and Noelia Corzo.

   Present, In-Person Satellite Location (Office of Santa Clara County, 70 W. Hedding St., 10th Floor Conference Room, San Jose, CA 95110): Director Margaret Abe-Koga.

   Present, In-Person Satellite Location (Alameda County Board of Supervisors District 3, Office of Supervisor Lena Tam, 101 Callan Avenue, Suite #103, San Leandro, CA 94577): Director Lena Tam.

   Present, In-Person Satellite Location (San Mateo County Board of Supervisors, 500 County Center, 5th Floor, Redwood City, CA 94063): Director Ray Mueller.

   Present, In-Person Satellite Location (City of San Bruno, 567 El Camino Real, Room 138, San Bruno, CA 94066): Director Rico E. Medina.

   Absent: Directors Brian Colbert, Joelle Gallagher, and Mark Salinas.

2. **PLEDGE OF ALLEGIANCE**

CONSENT CALENDAR (ITEMS 3 – 4)

3. **Approval of the Draft Minutes of the Policy, Grants, and Technology Committee Meeting of December 17, 2025**

The Committee considered approving the Draft Minutes of the Policy, Grants, and Technology Committee Meeting of December 17, 2025.

4. **Authorization to Participate in the Climate Heat Impact Response Program**

The Committee considered recommending that the Board of Directors (i) authorize the Air District's acceptance of Climate Heat Impact Response Program funds and participation in the program, and (ii) authorize the Executive Officer/APCO to enter into all necessary agreements to accept, obligate, and expend these funds.

Public Comments

No requests received.

Committee Comments

None.

Committee Action

Director Carlson made a motion, seconded by Vice Chair González, to **approve** Consent Calendar Items 3 – 4; and the motion **carried** by the following vote of the Committee:

AYES:	Abe-Koga, Carlson, Corzo, González, Medina, Mueller, Tam, Veenker.
NOES:	None.
ABSTAIN:	None.
ABSENT:	Colbet, Gallagher, Salinas.

ACTION ITEMS

5. **2026 LEGISLATIVE PLATFORM AND STATE AND FEDERAL LEGISLATIVE UPDATES**

Alan Abbs, Legislative Officer, gave the staff presentation *2026 Legislative Platform and State and Federal Legislative Updates,* including: abbreviations; recommended actions; recommended action #2 (State and Federal legislation); proposed 2026 Legislative Platform – State Budget, State legislation, Federal legislation and regulatory activity; State legislative updates – 2026 Legislative Session, Board-approved-position bills: Senate Bill (SB) 222 (Wiener), Assembly Bill (AB) 907 (Chen), Air District staff recommendations: AB 1777 (Garcia), additional bills for discussion; Federal legislative updates – Air District staff recommendations: House of Representatives (H.R.) 161 (Griffith-R-VA-9), H.R. 4214 (Allen-R-GA-12), H.R. 4218 (Carter-R-GA-1), H.R. 6387 (Evans-R-CO-8) **Note: Mr. Abbs pulled this bill for consideration during his presentation**; H.R. 6409 (Pfluger-R-TC-11), additional bills for discussion; and recap of recommended actions.

Public Comments

Public comments were given by Roger Lin, Center for Biological Diversity.

Committee Comments

The Committee and Air District staff discussed whether any climate superfunds have been introduced during the 2025 California Legislative Session thus far; how environmental regulation is currently being viewed by policymakers at the State: manufacturing facilities; and concerns regarding the US Environmental Protection Agency's recent rescission of the 2009 Greenhouse Gas Endangerment Finding, and the request for a chart that can explain to the full Board the endangerment finding process.

Committee Action

Vice Chair Gonzalez made a motion, seconded by Director Carlson, to recommend the Board (i) **adopt** the proposed 2026 Legislative Platform, and (ii) **adopt** positions on the following state and federal legislative bills:

State Legislation:

- Support Assembly Bill 1777 (Garcia)

Federal Legislation:

- Oppose House of Representatives Bill 161 (Griffith-R-VA-9)
- Oppose House of Representatives Bill 4214 (Allen-R-GA-12)
- Oppose House of Representatives Bill 4218 (Carter-R-GA-1)
- Oppose House of Representatives Bill 6409 (Pfluger-R-TX-11)

The motion **carried** by the following vote of the Committee:

AYES:	Abe-Koga, Carlson, Corzo, González, Medina, Mueller, Tam, Veenker.
NOES:	None.
ABSTAIN:	None.
ABSENT:	Colbet, Gallagher, Salinas.

6. **REPORT ON TRANSPORTATION FUND FOR CLEAN AIR PROJECTS EXPENDITURES AND EFFECTIVENESS FOR FISCAL YEAR ENDING 2025**

Dr. Minda Berbeco, Manager Strategic Incentives Division Manager, gave the staff presentation *Report on Transportation Fund for Clean Air (TFCA) Projects Expenditures and Effectiveness for Fiscal Year Ending 2025,* including: recommended action; TFCA; cost effectiveness; considerations for cost effectiveness limits; summary of project and program results; expenditures of project category; effectiveness and emissions reductions; next steps; and recommended action.

Public Comments

No requests received.

Committee Comments

The Committee and Air District staff discussed which criteria pollutants are the most difficult to remove from the air; whether the State has considered raising the $4 surcharge on motor vehicles; why "commuter benefits and enhanced mobile source inspections" are the smallest expenditure by project category; and the current maximum amount that participants can receive from the Air District's Vehicle Buy Back Program, and the suggestion of publishing data that shows how many vehicles have been retired by the program.

Committee Action

Director Carlson made a motion, seconded by Director Corzo, to recommend that the Board **adopt** a determination that the Transportation Fund for Clean Air Projects 60% Fund expenditures were effective in improving air quality in Fiscal Year Ending 2025; and the motion **carried** by the following vote of the Committee:

AYES:	Abe-Koga, Carlson, Corzo, González, Medina, Mueller, Tam, Veenker.
NOES:	None.
ABSTAIN:	None.
ABSENT:	Colbet, Gallagher, Salinas.

INFORMATIONAL ITEM

7. DATA CENTER OVERVIEW AND CONSIDERATIONS

Jamesine Rogers Gibson, Senior Advanced Projects Advisor, and Alan Abbs, Legislative Officer, gave the staff presentation *Data Center Overview and Considerations,* including: overview of data centers; types of data centers; siting considerations; data centers in the Bay Area; rapid growth in data center power demand; air pollution and back-up generation; infrastructure and ratepayer impacts; permitting and California Environmental Quality Act (CEQA) for data centers; and recent legislative activities.

Dr. Joshua Lappen, Air District Consultant and Postdoctoral Research Associate in the Keough School of Global Affairs at the University of Notre Dame, gave the presentation *Data Center Power - Grid Interactions and Backup Power,* including: outline; data centers and the grid; data center power usage; relevant entities; electric rate impacts; electrification goal impacts; other potential grid impacts; data center backup power; diesel backup impacts; mitigation approaches; backup power technologies; batter backup; and crafting solutions.

Public Comments

Public comments were given by Meya Saenz Zagar, Center for Biological Diversity; Roger Lin, Center for Biological Diversity; Ellina Yin, Dreaming Collaborative; Dr. Stephen Rosenblum, Palo Alto resident; Nina Robertson, Earthjustice; Joey Richardson, San Jose resident; Rich Saunders, San Jose resident; and Masheika Allgood.

Committee Comments

The Committee and Air District staff discussed the challenges regarding predicting power demand, and concerns of overbuilding; benefits of municipally-owned utility companies versus investor-owned utility companies, regarding power demand for data centers; whether policy makers are considered relevant entities (regarding this issue), and what other stakeholders might be considered relevant entities; entities involved in grid-scale battery storage; material variation in electricity consumption at data centers; concerns about and feasibility of battery backup as a revenue source; and how to measure health (short and long-term) impacts, based on the amount of data in data centers.

Committee Action

No action taken.

OTHER BUSINESS

8. PUBLIC COMMENT ON NON-AGENDA MATTERS

No requests received.

9. COMMMITTEE MEMBER COMMENTS

Vice Chair González thanked the Air District for its social media campaign on the Winter Spare the Air program, saying he appreciated the consistent messaging he has seen.

10. TIME AND PLACE OF NEXT MEETING

Wednesday, March 18, 2026, at 10:00 a.m. The meeting will be held in-person at the Bay Area Metro Center and at satellite locations as may be specified on the meeting agenda using a remote teleconferencing link. Members of the Policy, Grants, and Technology Committee and the public may attend at any of those in-person locations, and members of the public may also attend virtually via webcast.

11. ADJOURNMENT

The meeting was adjourned at 12:19 p.m.

Marcy Hiratzka
Clerk of the Boards

BAY AREA AIR DISTRICT
Memorandum

To: Chairperson Vicki Veenker and Members
of the Policy, Grants, and Technology Committee

From: Philip M. Fine
Executive Officer/APCO

Date: March 18, 2026

Re: State Legislative Updates

RECOMMENDED ACTION

Recommend to the Board of Directors that the Board adopt positions on pending state legislative bills where appropriate, including, but not limited to the following Air District staff recommendations:

SUPPORT	**OPPOSE**
Assembly Bill 2313 (Berman)	Assembly Bill 1791 (Sanchez)
Senate Bill 299 (Cabaldon)	Assembly Bill 2752 (Ávila Farías)
Senate Bill 954 (Blakespear)	Senate Bill 1392 (Cortese)

BACKGROUND

Attached are three bill reports:

1. Bills of Interest Matrix – all the bills that the Air District is currently tracking – arranged by category
2. Board-Approved-Position Bills
3. Additional Bills of Interest for Discussion

California State Legislature Upcoming Dates and Deadlines:

May 29, 2026	Last day for each house to pass bills introduced in that house
August 31, 2026	Last day for each house to pass bills
September 30, 2026	Last day for the Governor to sign or veto bills passed by the Legislature before September 1 and in the Governor's possession on or after September 1
November 3, 2026	General Election
November 30, 2026	Adjournment *sine die* at midnight
December 7, 2026	12 Noon convening of the 2027-28 Regular Session
January 1, 2027	Statutes take effect

DISCUSSION

The Committee will discuss and consider recommending that the Board approve the attached proposed 2026 Legislative Platform.

State Legislative Updates

Air District staff will provide a brief summary and status of active bills the Air District has taken a position on and may recommend additional bills to support, oppose and work with the author during the session. These bills include, but are not limited to the following:

Board-Approved-Position and/or Air District Staff Recommendation (if any):

Co-Sponsor:

- Senate Bill (SB) 222 (Wiener) – Heat Pump Access Act

Support:

- Assembly Bill (AB) 907 (Chen) – State Air Resources Board: board members: compensation

- AB 1777 (Garcia) – Air pollution: indirect sources

Propose Support:

- AB 2313 (Berman) – Gas corporations: gas distribution service line replacements: alternatives

  This bill, the Home Energy Choice Act, would require the California Public Utilities Commission (CPUC), in a new or existing proceeding, to require each gas corporation to offer a Gas Distribution Service Line Replacement Alternatives Program, on or before January 1, 2028, to provide gas customers served by a gas distribution service line, planned or forecasted for replacement over the next 5 years, or prioritized for replacement by the commission, with a monetary incentive to deploy gas distribution service line replacement alternatives, as defined, and cease gas service to avoid the gas distribution service line replacement, as specified. Air District staff recommends support, as this would allow a subset of homeowners the opportunity to disconnect natural gas service and fully electrify their homes, on a voluntary basis.

  Staff Recommendation: Support

- SB 299 (Cabaldon) – CEQA: exemption: day care center: family daycare home: zoning

  This bill would provide that an exemption from CEQA applies to a day care center on a parcel of land zoned exclusively for residential use. This is another bill seeking to fix problems with SB 131 (Committee on Budget and Fiscal Review, Chapter 24, Statutes of 2025) – a budget trailer bill from 2025 – which in this case provided a CEQA exemption for day care centers proposed on a parcel of land zoned as industrial, which ultimately made it easier to zone day care centers in industrial areas rather than residential areas. Air District staff recommends support in order to eliminate the incentive to site a day care facility in an industrial area because of the lack of a CEQA requirement.

  Staff Recommendation: Support

- SB 954 (Blakespear) – California Environmental Quality Act: exemptions: natural and protected lands: advanced manufacturing: childcare facilities

  This spot bill will seek to amend SB 131 (Committee on Budget and Fiscal Review, Chapter 24, Statutes of 2025) – a budget trailer bill from 2025 – that provided broad California Environmental Quality Act (CEQA) exemptions for "advanced manufacturing facilities" which ended up including a long list of potential industrial activities. Air District staff recommends support in order to narrow the list of industrial facilities that are eligible for CEQA exemptions. One of the benefits of going through a CEQA process is that it allows the project proponent and the air district an opportunity to better understand the project and inform the proponent of likely requirements during the resulting permit process.

  Staff Recommendation: Support

Propose Oppose:

- AB 1791 (Sanchez) – State Air Resources Board: South Coast Air Quality Management District: regulations: prohibition: costs

  This bill would prohibit the South Coast Air Quality Management District (South Coast AQMD) from adopting any regulation or rule that would add more than $0.02 to the cost of a gallon of gasoline, add $2,000 or more to the cost to build any home, or add $5,000 or more to the cost to build a nonresidential building. The bill would require the South Coast AQMD to submit data to the relevant policy committees of the Legislature that demonstrates how a proposed regulation is compliant with this prohibition. The bill does not establish a process for what the legislative policy committee does upon data submission, or at what point in the district's rulemaking process this action occurs. Air District staff recommends opposing this bill because while it currently only applies to the

South Coast AQMD, it sets a precedent that other large air districts could be subject to similar future requirements.

Staff Recommendation: Oppose

- AB 2752 (Ávila Farías) – Air quality management districts: oversight

  This bill would state the intent of the Legislature to enact future legislation to ensure accountability and oversight of the Bay Area Air District and the South Coast AQMD to ensure the rules and regulations they adopt are cost effective, affordable, and achievable. This bill is currently an "intent bill" that will be amended in the future, however, whether a rule is "cost effective, affordable, and achievable" is currently covered by Health and Safety Code Section 40728.5 Required Assessment. Staff of the Assemblymember has indicated this is an industry-supported bill. Air District staff recommends opposing this bill because it weakens the current rulemaking process and downplays the importance of public health protections in rulemaking.

  Staff Recommendation: Oppose

- SB 1392 (Cortese) – Smog check: exemption: collector motor vehicles

  This bill would redefine "collector motor vehicle" in state law and further exempt a collector motor vehicle manufactured before the 1981 model year from the requirement to pass biennial smog check. The bill would extend the applicability of this exemption by one model year each year, beginning on and after January 1, 2028, until the final extension takes effect on and after January 1, 2032, that would exempt a collector motor vehicle manufactured before the 1986 model year from the requirement to obtain the certificate of compliance or noncompliance. This bill is similar to last year's SB 712 (Grove) "Leno's Law," with some additional loopholes. This would remove smog check requirements for roughly 160,000 vehicles through the 1986 model year. Air District staff recommends opposing this bill due to the increase in emissions resulting from having the oldest and most polluting vehicles exempted from smog check requirements, which include visual requirements that prevent tampering and installation of non-approved equipment.

  Staff Recommendation: Oppose

Additional Bills of Interest for Discussion:

- AB 2046 (Ransom) – Vehicles: pollution control devices
- AB 2102 (DeMaio) – Wildfire: vegetation management: fuel reduction activities

- AB 2635 (C. Rodriguez) – Air pollution: small off-road engines: rebate programs: local regulation
- SB 875 (Wiener) – Public utilities: eminent domain
- SB 1075 (Reyes) – Air resources: toxic air contaminants: criteria air pollutants: community emissions reduction programs
- SB 1097 (Wiener) – Energy: permit streamlining
- SB 1259 (Blakespear) – Refineries: decommissioning and remediation: cost estimate

Additional bill information may be found on the California Legislative Information website.

BUDGET CONSIDERATION/FINANCIAL IMPACT

None.

Respectfully submitted,

Philip M. Fine
Executive Officer/APCO

Prepared by: Alan Abbs
Reviewed by: Viet Tran

ATTACHMENT(S):

1. Bills of Interest Matrix - As of March 10, 2026 - By Category
2. Board-Approved-Position Bills - As of March 10, 2026
3. Additional Bills of Interest for Discussion - As of March 10, 2026
4. AB 1791 (Sanchez) - Bill Text - As Introduced on February 10, 2026
5. AB 2313 (Berman) - Bill Text - As Introduced on February 19, 2026
6. AB 2752 (Ávila Farías) - Bill Text - As Introduced on February 20, 2026
7. SB 299 (Cabaldon) - Bill Text - As Amended on January 14, 2026
8. SB 954 (Blakespear) - Bill Text - As Introduced on February 2, 2026
9. SB 1392 (Cortese) - Bill Text - As Introduced on February 20, 2026
10. State Legislative Update Presentation

Bill #	Author	Subject	Last Amended	Last Status - As of 3/10/2026	Location	Notes	Position	Priority (Low/Medium/High)	Category
AB 107	Gabriel	Budget Acts of 2023, 2024, and 2025.	2/13/2026	02/19/2026 - Chaptered by Sec. of State- Chapter 5, Statutes of 2026	02/19/2026 - Assembly CHAPTERED			Low	Budget Related Bills
AB 1563	Gabriel	Budget Act of 2026.		01/10/2026 - From printer.	01/09/2026 - Assembly PRINT			Medium	Budget Related Bills
AB 1862	Boerner	Use of Taxpayer Funds Act.		02/12/2026 - From printer. May be heard in committee March 14.	02/11/2026 - Assembly PRINT			Low	Budget Related Bills
SB 107	Laird	Budget Acts of 2023, 2024, and 2025.	2/13/2026	02/23/2026 - Re-referred to Com. on BUDGET pursuant to Assembly Rule 97.	02/23/2026 - Assembly Budget			Low	Budget Related Bills
SB 417	Cabaldon	The Affordable Housing Bond Act of 2026.	1/22/2026	01/27/2026 - Read third time. Urgency clause adopted. Passed. (Ayes 30. Noes 9.) Ordered to the Assembly. In Assembly. Read first time. Held at Desk.	01/27/2026 - Assembly DESK			Low	Budget Related Bills
SB 879	Laird	Budget Act of 2026.		01/12/2026 - Read first time.	01/09/2026 - Senate Budget and Fiscal Review			Medium	Budget Related Bills
AB 839	Rubio, Blanca	California Environmental Quality Act: expedited judicial review: sustainable aviation fuel projects.	6/24/2025	07/17/2025 - Failed Deadline pursuant to Rule 61(a)(10). (Last location was E.Q. on 6/4/2025)(May be acted upon Jan 2026)	07/17/2025 - Senate 2 YEAR			Low	CEQA
AB 1553	Connolly	California Environmental Quality Act.		01/09/2026 - From printer. May be heard in committee February 8.	01/08/2026 - Assembly PRINT			Medium	CEQA
AB 1612	Alanis	Incineration of controlled substances: California Environmental Quality Act: law enforcement exemption.		03/02/2026 - Referred to Coms. on NAT. RES. and E.S & T.M.	03/02/2026 - Assembly Natural Resources			Low	CEQA
AB 1855	Gonzalez, Jeff	California Environmental Quality Act: exemption: passenger rail service.		02/23/2026 - Referred to Com. on NAT. RES.	02/23/2026 - Assembly Natural Resources			Low	CEQA
AB 2170	Boerner	California Environmental Quality Act.		02/19/2026 - From printer. May be heard in committee March 21.	02/18/2026 - Assembly PRINT			Low	CEQA
AB 2231	Ahrens	California Environmental Quality Act: administrative and judicial procedures.		02/20/2026 - From printer. May be heard in committee March 22.	02/19/2026 - Assembly PRINT			Low	CEQA
AB 2552	Ávila Farías	California Environmental Quality Act: transportation impact mitigation.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	CEQA
AB 2569	Hart	California Environmental Quality Act: natural hazards and adverse environmental conditions.		03/09/2026 - Referred to Com. on NAT. RES.	03/09/2026 - Assembly Natural Resources			Low	CEQA
AB 2672	Hart	California Environmental Protection Agency: study: revenue.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Medium	CEQA
AB 2736	Johnson	California Environmental Quality Act.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	CEQA
SB 299	Cabaldon	California Environmental Quality Act: exemption: day care center: family daycare home: zoning.	1/14/2026	01/26/2026 - Read third time. Passed. (Ayes 39. Noes 0.) Ordered to the Assembly. In Assembly. Read first time. Held at Desk.	01/26/2026 - Assembly DESK		Propose Support	Medium	CEQA
SB 954	Blakespear	California Environmental Quality Act: exemptions: natural and protected lands: advanced manufacturing: childcare facilities.		02/11/2026 - Referred to Com. on RLS.	02/02/2026 - Senate Rules		Propose Support	Medium	CEQA
SB 1184	McGuire	California Environmental Quality Act.		02/26/2026 - Referred to Com. on RLS.	02/18/2026 - Senate Rules			Low	CEQA
SB 1260	Jones	California Environmental Quality Act.		03/04/2026 - Referred to Com. on RLS.	02/19/2026 - Senate Rules			Low	CEQA
AB 643	Wilson	Climate change: short-lived climate pollutants: organic waste reduction.	1/14/2026	01/27/2026 - In Senate. Read first time. To Com. on RLS. for assignment.	01/27/2026 - Senate Rules			Low	Climate Change
AB 2638	Petrie-Norris	Climate Innovation Program.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Climate Change
SB 982	Wiener	Climate disasters: civil actions.		02/11/2026 - Referred to Coms. on JUD. and INS.	02/11/2026 - Senate Judiciary			Low	Climate Change
SB 1266	Stern	Greenhouse gases: endangerment findings.		03/04/2026 - Referred to Coms. on E.Q. and G.O.	03/04/2026 - Senate Environmental Quality			Low	Climate Change
SB 1300	Stern	California Global Warming Solutions Act of 2006: report.		03/04/2026 - Referred to Com. on E.Q.	03/04/2026 - Senate Environmental Quality			Low	Climate Change
AB 34	Patterson	California Renewables Portfolio Standard Program: local publicly owned electric utilities: large hydroelectric generation.	1/5/2026	01/27/2026 - In Senate. Read first time. To Com. on RLS. for assignment.	01/27/2026 - Senate Rules			Low	Energy | Data Centers
AB 1016	Gonzalez, Jeff	Power facility and site certifications: thermal powerplants: geothermal resources.	6/19/2025	07/17/2025 - Failed Deadline pursuant to Rule 61(a)(10). (Last location was E. U., & C. on 6/4/2025)(May be acted upon Jan 2026)	07/17/2025 - Senate 2 YEAR			Low	Energy | Data Centers
AB 1577	Bauer-Kahan	Data centers: monthly reporting.		01/13/2026 - From printer. May be heard in committee February 12.	01/12/2026 - Assembly PRINT			Medium	Energy | Data Centers
AB 1677	Boerner	Public utilities: affordability.		03/09/2026 - Referred to Com. on U. & E.	03/09/2026 - Assembly Utilities and Energy			Low	Energy | Data Centers
AB 1849	Papan	Decarbonized gaseous fuels.		02/12/2026 - From printer. May be heard in committee March 14.	02/11/2026 - Assembly PRINT			Low	Energy | Data Centers
AB 2057	DeMaio	Building standards: natural gas.		03/09/2026 - Referred to Coms. on H. & C.D. and U. & E.	03/09/2026 - Assembly Housing and Community Development			Low	Energy | Data Centers
AB 2088	Papan	Public Utilities: gas corporations: duty to serve: thermal energy networks.		03/02/2026 - Referred to Com. on U. & E.	03/02/2026 - Assembly Utilities and Energy			Low	Energy | Data Centers

Bill #	Author	Subject	Last Amended	Last Status - As of 3/10/2026	Location	Notes	Position	Priority (Low/Medium/High)	Category
AB 2111	Papan	Electricity: transmission planning and transmission facilities.		03/09/2026 - Referred to Com. on U. & E.	03/09/2026 - Assembly Utilities and Energy			Low	Energy | Data Centers
AB 2124	Pacheco	Electricity and natural gas: legislation imposing mandated programs and requirements: third-party review.		03/02/2026 - Referred to Com. on U. & E.	03/02/2026 - Assembly Utilities and Energy			Low	Energy | Data Centers
AB 2163	Gonzalez, Jeff	Electricity: County of Imperial and Lithium Valley.		03/02/2026 - Referred to Com. on U. & E.	03/02/2026 - Assembly Utilities and Energy			Low	Energy | Data Centers
AB 2175	Garcia	Electricity: electrical transmission and distribution systems.		03/09/2026 - Referred to Com. on U. & E.	03/09/2026 - Assembly Utilities and Energy			Low	Energy | Data Centers
AB 2182	Irwin	Electrical corporations: Industrial Decarbonization and Energy Efficiency Program.		03/09/2026 - Referred to Coms. on U. & E. and NAT. RES.	03/09/2026 - Assembly Utilities and Energy			Low	Energy | Data Centers
AB 2313	Berman	Gas corporations: gas distribution service line replacements: alternatives.		03/09/2026 - Referred to Com. on U. & E.	03/09/2026 - Assembly Utilities and Energy		Propose Support	Medium	Energy | Data Centers
AB 2383	Zbur	Electricity: large energy use facilities.		03/09/2026 - Referred to Com. on U. & E.	03/09/2026 - Assembly Utilities and Energy			Low	Energy | Data Centers
AB 2408	DeMaio	Energy: billing.		03/09/2026 - Referred to Com. on U. & E.	03/09/2026 - Assembly Utilities and Energy			Low	Energy | Data Centers
AB 2458	Bennett	Energy: appliance standards and cost-effective measures.		03/09/2026 - Referred to Com. on U. & E.	03/09/2026 - Assembly Utilities and Energy			Low	Energy | Data Centers
AB 2459	Wallis	Electricity: climate credits.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Energy | Data Centers
AB 2464	Wicks	Energy: clean, firm resources.		03/09/2026 - Referred to Com. on U. & E.	03/09/2026 - Assembly Utilities and Energy			Low	Energy | Data Centers
AB 2505	Carrillo	Electrical corporations: hydrogen refueling stations.		03/09/2026 - Referred to Com. on U. & E.	03/09/2026 - Assembly Utilities and Energy			Low	Energy | Data Centers
AB 2508	Hoover	Public Utilities Public Purpose Programs Fund.		03/09/2026 - Referred to Com. on U. & E.	03/09/2026 - Assembly Utilities and Energy			Low	Energy | Data Centers
AB 2516	Petrie-Norris	California Grid Manufacturing Initiative.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Energy | Data Centers
AB 2543	Ransom	Emergency preparedness: electric vehicle charging infrastructure.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Energy | Data Centers
AB 2608	Patterson	Energy: transportation fuels assessment.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Energy | Data Centers
AB 2612	Schultz	Building standards: qualified plug-in photovoltaic systems.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Energy | Data Centers
AB 2619	Papan	Water resources: data centers.		03/09/2026 - Referred to Coms. on W., P., & W. and L. GOV.	03/09/2026 - Assembly Water, Parks and Wildlife			Low	Energy | Data Centers
AB 2700	Gallagher	Public utilities: rates.		03/09/2026 - Referred to Com. on U. & E.	03/09/2026 - Assembly Utilities and Energy			Low	Energy | Data Centers
AB 2748	Quirk-Silva	Building standards: affordable housing developments: electric vehicle charging.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Energy | Data Centers
SB 222	Wiener	Residential heat pump systems: water heaters and HVAC: installations.	1/15/2026	01/26/2026 - Read third time. Passed. (Ayes 29. Noes 8.) Ordered to the Assembly. In Assembly. Read first time. Held at Desk.	01/26/2026 - Assembly DESK	Board Approval 2/4/2026	Air District Co-Sponsor	High	Energy | Data Centers
SB 540	Becker	Independent System Operator: independent regional organization: California Renewables Portfolio Standard Program.	5/29/2025	09/09/2025 - Failed Deadline pursuant to Rule 61(a)(10). (Last location was U. & E. on 7/10/2025)(May be acted upon Jan 2026)	07/17/2025 - Assembly 2 YEAR			Low	Energy | Data Centers
SB 875	Wiener	Public utilities: eminent domain.	2/24/2026	03/04/2026 - Re-referred to Coms. on JUD. and E., U & C.	03/04/2026 - Senate Judiciary			Low	Energy | Data Centers
SB 886	Padilla	California Technology Innovation and Ratepayer Protection Act.	3/5/2026	03/09/2026 - Set for hearing March 17.	02/11/2026 - Senate Energy, Utilities and Communications			Low	Energy | Data Centers
SB 887	Padilla	California Environmental Quality Act: environmental leadership development projects: data centers: clean energy powerplant projects.	3/9/2026	03/09/2026 - From committee with author's amendments. Read second time and amended. Re-referred to Com. on E.Q.	02/11/2026 - Senate Environmental Quality			Low	Energy | Data Centers
SB 913	Becker	Alternative certification.		02/11/2026 - Referred to Com. on RLS.	01/27/2026 - Senate Rules			Low	Energy | Data Centers
SB 940	Grove	Geothermal resources: oil and gas reservoirs.		02/11/2026 - Referred to Com. on N.R. & W.	02/11/2026 - Senate Natural Resources and Water			Low	Energy | Data Centers
SB 943	Becker	Public utilities: electricity: transmission charge: industrial transition usage.		03/09/2026 - Set for hearing March 17.	02/11/2026 - Senate Energy, Utilities and Communications			Low	Energy | Data Centers

Bill #	Author	Subject	Last Amended	Last Status - As of 3/10/2026	Location	Notes	Position	Priority (Low/Medium/High)	Category
SB 978	Pérez	Large-scale energy facilities: labor: electricity rates.	3/9/2026	03/09/2026 - Set for hearing March 17. From committee with author's amendments. Read second time and amended. Re-referred to Com. on E., U & C.	02/11/2026 - Senate Energy, Utilities and Communications			Low	Energy | Data Centers
SB 1097	Wiener	Energy: permit streamlining.		02/26/2026 - Referred to Com. on RLS.	02/13/2026 - Senate Rules			Medium	Energy | Data Centers
SB 1168	McNerney	Data centers: natural gas and electricity: surcharges.		02/26/2026 - Referred to Coms. on E., U & C. and REV. & TAX.	02/26/2026 - Senate Energy, Utilities and Communications			Low	Energy | Data Centers
SB 1215	Cortese	Electrical corporations: electric vehicle charging stations: multifamily residential properties.		03/04/2026 - Referred to Com. on E., U & C.	03/04/2026 - Senate Energy, Utilities and Communications			Low	Energy | Data Centers
SB 1245	Stern	Renewable energy resources: electrical transmission and distribution grid.		03/04/2026 - Referred to Com. on RLS.	02/19/2026 - Senate Rules			Low	Energy | Data Centers
SB 1282	Becker	Transportation electrification: grid-integrated vehicle technologies: standards.		03/04/2026 - Referred to Com. on E., U & C.	03/04/2026 - Senate Energy, Utilities and Communications			Low	Energy | Data Centers
SB 1295	Stern	Energy storage systems: procurement.		03/04/2026 - Referred to Com. on E., U & C.	03/04/2026 - Senate Energy, Utilities and Communications			Low	Energy | Data Centers
SB 1337	Richardson	Transportation fuels: interagency working group.		03/04/2026 - Referred to Com. on E., U & C.	03/04/2026 - Senate Energy, Utilities and Communications			Low	Energy | Data Centers
SB 1350	McNerney	Energy: renewable electrical generation facilities: definition.		03/04/2026 - Referred to Coms. on E., U & C. and E.Q.	03/04/2026 - Senate Energy, Utilities and Communications			Low	Energy | Data Centers
SB 1354	Archuleta	Energy: renewable energy resources program.		03/04/2026 - Referred to Com. on RLS.	02/20/2026 - Senate Rules			Low	Energy | Data Centers
SB 1359	Stern	Natural gas: surcharge.		03/04/2026 - Referred to Com. on RLS.	02/20/2026 - Senate Rules			Low	Energy | Data Centers
AB 1584	Jackson	State Air Resources Board: Office of Civil Rights.		01/14/2026 - From printer. May be heard in committee February 13.	01/13/2026 - Assembly PRINT			Low	Environmental Justice
AB 1600	Arambula	Disadvantaged communities: farmworker communities.		02/09/2026 - Referred to Com. on E.S & T.M.	02/09/2026 - Assembly Environmental Safety and Toxic Materials			Low	Environmental Justice
AB 2712	Ellis	Oil and gas: restrictions: health protection zones.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Environmental Justice
SB 1075	Reyes	Air resources: toxic air contaminants: criteria air pollutants: community emissions reduction programs.		02/26/2026 - Referred to Com. on RLS.	02/13/2026 - Senate Rules			Medium	Environmental Justice
AB 259	Rubio, Blanca	Open meetings: local agencies: teleconferences.	4/21/2025	07/17/2025 - Failed Deadline pursuant to Rule 61(a)(10). (Last location was JUD. on 5/14/2025)(May be acted upon Jan 2026)	07/17/2025 - Senate 2 YEAR			Low	General-Air District
AB 1578	Jackson	State and local officials: antihate speech training.		03/09/2026 - Referred to Coms. on L. GOV. and G.O.	03/09/2026 - Assembly Local Government			Low	General-Air District
AB 1791	Sanchez	State Air Resources Board: South Coast Air Quality Management District: regulations: prohibition: costs.		02/23/2026 - Referred to Com. on NAT. RES.	02/23/2026 - Assembly Natural Resources		Propose Oppose	Medium	General-Air District
AB 2635	Rodriguez, Celeste	Air pollution: small off-road engines: rebate programs: local regulation.		03/09/2026 - Referred to Com. on NAT. RES.	03/09/2026 - Assembly Natural Resources			Medium	General-Air District
AB 2752	Ávila Farías	Air quality management districts: oversight.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT		Propose Oppose	High	General-Air District
SB 58	Padilla	Air quality: standard: hydrogen sulfide.	1/14/2026	01/26/2026 - Read third time. Passed. (Ayes 39. Noes 0.) Ordered to the Assembly. In Assembly. Read first time. Held at Desk.	01/26/2026 - Assembly DESK			Low	General-Air District
SB 526	Menjivar	South Coast Air Quality Management District: air quality.	4/29/2025	07/17/2025 - Failed Deadline pursuant to Rule 61(a)(10). (Last location was NAT. RES. on 6/16/2025)(May be acted upon Jan 2026)	07/17/2025 - Assembly 2 YEAR			Low	General-Air District
SB 1039	Grove	Air resources: refinery-related community air monitoring system.		02/25/2026 - Set for hearing March 18.	02/18/2026 - Senate Environmental Quality			Low	General-Air District
AB 35	Alvarez	Safe Drinking Water, Wildfire Prevention, Drought Preparedness, and Clean Air Bond Act of 2024: Administrative Procedure Act: exemption: program guidelines and selection criteria.	1/14/2026	01/27/2026 - In Senate. Read first time. To Com. on RLS. for assignment.	01/27/2026 - Senate Rules			Low	GGRF | Incentive Programs | Mobile Source | Cap and Invest
AB 117	Committee	Transit and Intercity Rail Capital Program: loans: transit operating purposes: San Francisco Bay area.	2/13/2026	02/19/2026 - Chaptered by Sec. of State- Chapter 6, Statutes of 2026	02/19/2026 - Assembly CHAPTERED			Low	GGRF | Incentive Programs | Mobile Source | Cap and Invest
AB 272	Aguiar-Curry	Heavy-Duty Vehicle Inspection and Maintenance Program.	3/13/2025	09/11/2025 - Failed Deadline pursuant to Rule 61(a)(14). (Last location was INACTIVE FILE on 9/2/2025)(May be acted upon Jan 2026)	09/11/2025 - Senate 2 YEAR			Low	GGRF | Incentive Programs | Mobile Source | Cap and Invest
AB 605	Muratsuchi	Lower Emissions Cargo Handling Equipment Pilot program.	4/10/2025	07/17/2025 - Failed Deadline pursuant to Rule 61(a)(10). (Last location was E.Q. on 6/18/2025)(May be acted upon Jan 2026)	07/17/2025 - Senate 2 YEAR			Low	GGRF | Incentive Programs | Mobile Source | Cap and Invest
AB 745	Irwin	Electricity: climate credits.	5/30/2025	09/11/2025 - Failed Deadline pursuant to Rule 61(a)(14). (Last location was INACTIVE FILE on 9/10/2025)(May be acted upon Jan 2026)	09/11/2025 - Senate 2 YEAR			Low	GGRF | Incentive Programs | Mobile Source | Cap and Invest

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AB 1039	Hart	State-funded assistance grants and contracts: advance payments.	6/18/2025	08/28/2025 - Failed Deadline pursuant to Rule 61(a)(11). (Last location was APPR. on 7/8/2025)(May be acted upon Jan 2026)	08/28/2025 - Senate 2 YEAR			Low	GGRF | Incentive Programs | Mobile Source | Cap and Invest
AB 1745	Gonzalez, Jeff	Motor Vehicle Fuel Tax Law: suspension of tax.		02/23/2026 - Referred to Com. on TRANS.	02/23/2026 - Assembly Transportation			Low	GGRF | Incentive Programs | Mobile Source | Cap and Invest
AB 1822	Muratsuchi	School facilities: project priorities: extreme heat and climate change.		02/23/2026 - Referred to Com. on ED.	02/23/2026 - Assembly Education			Low	GGRF | Incentive Programs | Mobile Source | Cap and Invest
AB 2184	Wilson	Cap-and-Invest Program: nature-based climate solutions: funding.		03/09/2026 - Referred to Com. on NAT. RES.	03/09/2026 - Assembly Natural Resources			Low	GGRF | Incentive Programs | Mobile Source | Cap and Invest
SB 872	McNerney	Climate change: funding priorities.	2/18/2026	03/03/2026 - Set for hearing March 18.	02/26/2026 - Senate Environmental Quality			Low	GGRF | Incentive Programs | Mobile Source | Cap and Invest
SB 1035	Strickland	Motor vehicle fuel tax: greenhouse gas reduction programs: suspension.		02/25/2026 - Set for hearing March 18.	02/18/2026 - Senate Environmental Quality			Medium	GGRF | Incentive Programs | Mobile Source | Cap and Invest
SB 1411	Stern	Greenhouse Gas Reduction Fund: funding conditions: high-speed rail.		03/04/2026 - Referred to Coms. on TRANS. and E.Q.	03/04/2026 - Senate Transportation			Low	GGRF | Incentive Programs | Mobile Source | Cap and Invest
AB 28	Schiavo	Solid waste landfills: subsurface temperatures.	9/3/2025	09/11/2025 - Failed Deadline pursuant to Rule 61(a)(14). (Last location was INACTIVE FILE on 9/8/2025)(May be acted upon Jan 2026)	09/11/2025 - Senate 2 YEAR			Low	Other
AB 40	Bryan	Redistricting: congressional districts.	8/21/2025	09/13/2025 - Ordered to inactive file at the request of Senator Grayson.	09/13/2025 - Senate INACTIVE FILE			Low	Other
AB 306	Schultz	Building regulations: state building standards.	6/23/2025	06/23/2025 - From committee chair, with author's amendments: Amend, and re-refer to committee. Read second time, amended, and re-referred to Com. on HOUSING.	04/23/2025 - Senate Housing			Low	Other
AB 881	Petrie-Norris	Public resources: transportation of carbon dioxide.	8/28/2025	09/13/2025 - Failed Deadline pursuant to Rule 61(a)(14). (Last location was INACTIVE FILE on 9/8/2025)(May be acted upon Jan 2026)	09/11/2025 - Assembly 2 YEAR			Low	Other
AB 907	Chen	State Air Resources Board: board members: compensation.		07/17/2025 - Failed Deadline pursuant to Rule 61(a)(10). (Last location was E.Q. on 6/18/2025)(May be acted upon Jan 2026)	07/17/2025 - Senate 2 YEAR	Board Approval 2/5/2025	Support	Medium	Other
AB 1337	Ward	Information Practices Act of 1977.	5/23/2025	07/17/2025 - Failed Deadline pursuant to Rule 61(a)(10). (Last location was JUD. on 6/11/2025)(May be acted upon Jan 2026)	07/17/2025 - Senate 2 YEAR			Low	Other
AB 1338	Solache	Metal shredding facilities: regulations.	4/3/2025	07/17/2025 - Failed Deadline pursuant to Rule 61(a)(10). (Last location was E.Q. on 6/4/2025)(May be acted upon Jan 2026)	07/17/2025 - Senate 2 YEAR			Low	Other
AB 1684	Ward	Common interest developments: cooling systems.		02/23/2026 - Referred to Coms. on H. & C.D. and JUD.	02/23/2026 - Assembly Housing and Community Development			Medium	Other
AB 1704	González, Mark	Greenhouse gases: embodied carbon building materials.	3/2/2026	03/03/2026 - Re-referred to Com. on NAT. RES.	03/02/2026 - Assembly Natural Resources			Low	Other
AB 1725	Caloza	Residential buildings: methane mitigation systems.		02/06/2026 - From printer. May be heard in committee March 8.	02/05/2026 - Assembly PRINT			Low	Other
AB 1751	Quirk-Silva	Missing Middle Townhome Ownership Act.		02/23/2026 - Referred to Coms. on H. & C.D. and L. GOV.	02/23/2026 - Assembly Housing and Community Development			Low	Other
AB 1840	Sanchez	Political Reform Act of 1974: prediction market contracts.		02/23/2026 - Referred to Com. on ELECTIONS.	02/23/2026 - Assembly Elections			Low	Other
AB 2063	Wallis	Legislative information system: bill position letters.		02/19/2026 - From printer. May be heard in committee March 21.	02/18/2026 - Assembly PRINT			Low	Other
AB 2100	Connolly	Organic waste: manure management: interagency task force: project approval.		03/09/2026 - Referred to Com. on NAT. RES.	03/09/2026 - Assembly Natural Resources			Low	Other
AB 2112	Bains	Integrated waste management plans: annual report.		03/02/2026 - Referred to Com. on NAT. RES.	03/02/2026 - Assembly Natural Resources			Low	Other
AB 2349	Solache	State Air Resources Board: regional air quality incident response program.		03/09/2026 - Referred to Com. on NAT. RES.	03/09/2026 - Assembly Natural Resources			Low	Other
AB 2413	Ransom	Large-format public advertisements: public expense.		03/09/2026 - Referred to Com. on ELECTIONS.	03/09/2026 - Assembly Elections			Low	Other
AB 2432	Ellis	State Air Resources Board: regulations: analysis of financial impact on drivers.		03/09/2026 - Referred to Com. on NAT. RES.	03/09/2026 - Assembly Natural Resources			Low	Other
AB 2498	Chen	Local government: open meetings.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Other
AB 2501	Lackey	Local government.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Other
AB 2521	Papan	San Francisco Bay Conservation and Development Commission.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Other
AB 2529	Johnson	Civil claims: public employees: perjury.		03/09/2026 - Referred to Com. on JUD.	03/09/2026 - Assembly Judiciary			Low	Other

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AB 2557	Bauer-Kahan	Legislative information system: bill position letters.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Other
AB 2606	Ellis	Oil and gas: demonstration zones: California State University, Bakersfield.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Other
AB 2623	Petrie-Norris	State Air Resources Board.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Other
SB 239	Arreguín	Open meetings: teleconferencing: subsidiary body.	4/7/2025	01/27/2026 - Read third time. Passed. (Ayes 29. Noes 11.) Ordered to the Assembly. In Assembly. Read first time. Held at Desk.	01/27/2026 - Assembly DESK			Low	Other
SB 522	Wahab	Housing: tenant protections.	9/3/2025	09/11/2025 - Failed Deadline pursuant to Rule 61(a)(14). (Last location was INACTIVE FILE on 9/10/2025)(May be acted upon Jan 2026)	09/11/2025 - Assembly 2 YEAR			Low	Other
SB 811	Caballero	Hazardous materials: metal shredding facilities.	1/22/2026	01/27/2026 - Read third time. Passed. (Ayes 40. Noes 0.) Ordered to the Assembly. In Assembly. Read first time. Held at Desk.	01/27/2026 - Assembly DESK			Low	Other
SB 885	Strickland	Major regulations.		02/11/2026 - Referred to Com. on G.O.	02/11/2026 - Senate Governmental Organization			Low	Other
SB 981	Niello	Administrative regulations: standardized regulatory impact analysis: State Air Resources Board.	3/9/2026	03/09/2026 - From committee with author's amendments. Read second time and amended. Re-referred to Com. on E.Q.	02/11/2026 - Senate Environmental Quality			Low	Other
SB 986	Seyarto	Major regulations.		02/18/2026 - Referred to Coms. on G.O. and JUD.	02/18/2026 - Senate Governmental Organization			Low	Other
SB 994	Cabaldon	Local government: nondisclosure agreements.		02/18/2026 - Referred to Coms. on JUD. and L. GOV.	02/18/2026 - Senate Judiciary			Low	Other
SB 1024	Menjivar	Meyers-Milias-Brown Act.		02/18/2026 - Referred to Com. on RLS.	02/10/2026 - Senate Rules			Low	Other
SB 1118	Alvarado-Gil	Personal Income Tax Law: Corporation Tax Law: tax credits: backup generators: solar batteries.		02/26/2026 - Referred to Com. on REV. & TAX.	02/26/2026 - Senate Revenue and Taxation			Low	Other
SB 1123	Wiener	Administrative Procedure Act: major regulations.		02/26/2026 - Referred to Com. on G.O.	02/26/2026 - Senate Governmental Organization			Low	Other
SB 1159	Cabaldon	Artificial intelligence: transparency and governance.		03/04/2026 - Referred to Coms. on JUD. and P., D.T., & C.P.	03/04/2026 - Senate Judiciary			Low	Other
SB 1161	Valladares	Administrative regulations: economic impact analysis: State Air Resources Board.		02/26/2026 - Referred to Com. on E.Q.	02/26/2026 - Senate Environmental Quality			Low	Other
SB 1187	Durazo	Open meetings: majority.		03/04/2026 - Referred to Com. on L. GOV.	03/04/2026 - Senate Local Government			Low	Other
SB 1204	Ochoa Bogh	Administrative regulations.		03/04/2026 - Referred to Com. on G.O.	03/04/2026 - Senate Governmental Organization			Low	Other
SB 1239	Jones	State Air Resources Board: regulations: supplemental impact analysis.		03/04/2026 - Referred to Com. on E.Q.	03/04/2026 - Senate Environmental Quality			Low	Other
SB 1259	Blakespear	Refineries: decommissioning and remediation: cost estimates.		03/04/2026 - Referred to Coms. on E.Q. and E., U & C.	03/04/2026 - Senate Environmental Quality			Low	Other
SB 1267	Allen	Common interest developments: electric vehicle charging stations owned by members in common areas.		03/04/2026 - Referred to Coms. on HOUSING and JUD.	03/04/2026 - Senate Housing			Low	Other
AB 735	Carrillo	Planning and zoning: logistics use developments: truck routes.	9/9/2025	09/13/2025 - Failed Deadline pursuant to Rule 61(a)(14). (Last location was INACTIVE FILE on 9/13/2025)(May be acted upon Jan 2026)	09/13/2025 - Senate 2 YEAR			Low	Transportation
AB 1777	Garcia	Air pollution: indirect sources.		02/23/2026 - Referred to Com. on NAT. RES.	02/23/2026 - Assembly Natural Resources	Board Approval 3/4/2026	Support	Medium	Transportation
AB 1783	DeMaio	Additional local taxes: vehicle miles traveled tax.		02/10/2026 - From printer. May be heard in committee March 12.	02/09/2026 - Assembly PRINT			Low	Transportation
AB 2046	Ransom	Vehicles: pollution control devices.		03/02/2026 - Referred to Com. on TRANS.	03/02/2026 - Assembly Transportation			Low	Transportation
AB 2296	Papan	Land use.		02/20/2026 - From printer. May be heard in committee March 22.	02/19/2026 - Assembly PRINT			Low	Transportation
AB 2397	Ta	Planning and zoning.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Transportation
AB 2541	González, Mark	Vehicle weight fees.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Transportation
AB 2560	Schultz	Climate Action Plan for Transportation Infrastructure: goals.		03/09/2026 - Referred to Com. on TRANS.	03/09/2026 - Assembly Transportation			Low	Transportation
SB 117	Committee	Transit and Intercity Rail Capital Program: loans: transit operating purposes: San Francisco Bay area.	2/13/2026	02/23/2026 - Re-referred to Com. on BUDGET pursuant to Assembly Rule 97.	02/23/2026 - Assembly Budget			Low	Transportation
SB 1064	Dahle	Heavy-Duty Vehicle Inspection and Maintenance Program: biennial testing.		03/09/2026 - March 18 set for first hearing canceled at the request of author.	02/26/2026 - Senate Environmental Quality			Low	Transportation

Bill #	Author	Subject	Last Amended	Last Status - As of 3/10/2026	Location	Notes	Position	Priority (Low/Medium/High)	Category
SB 1069	Grayson	Motor vehicle pollution control devices: aftermarket parts: approval process.		02/26/2026 - Referred to Com. on E.Q.	02/26/2026 - Senate Environmental Quality			Low	Transportation
SB 1392	Cortese	Smog check: exemption: collector motor vehicles.		03/04/2026 - Referred to Com. on TRANS.	03/04/2026 - Senate Transportation		Propose Oppose	High	Transportation
SB 1424	Archuleta	Electric vehicle service equipment: advisory board.		03/04/2026 - Referred to Com. on E., U & C.	03/04/2026 - Senate Energy, Utilities and Communications			Low	Transportation
AB 1699	Rogers	Good Fire Act: Prescribed Fire Liability Pilot Program: burn bosses: California Environmental Quality Act.		03/09/2026 - Referred to Coms. on NAT. RES. and E.M.	03/09/2026 - Assembly Natural Resources			Low	Wildfire | Smoke | PSPS
AB 1873	Bennett	County of Ventura: fire suppression: backup energy source.		03/02/2026 - Referred to Coms. on E.M and U. & E.	03/02/2026 - Assembly Emergency Management			Low	Wildfire | Smoke | PSPS
AB 1891	Connolly	Forestry: Beneficial Fire Capacity Program.		03/02/2026 - Referred to Com. on NAT. RES.	03/02/2026 - Assembly Natural Resources			Low	Wildfire | Smoke | PSPS
AB 2102	DeMaio	Wildfire: vegetation management: fuel reduction activities.		03/09/2026 - Referred to Coms. on NAT. RES. and E.M.	03/09/2026 - Assembly Natural Resources			Low	Wildfire | Smoke | PSPS
AB 2410	Ellis	Wildfire safety: fuels reduction projects: California Environmental Quality Act: California Coastal Act.		03/09/2026 - Referred to Com. on NAT. RES.	03/09/2026 - Assembly Natural Resources			Low	Wildfire | Smoke | PSPS
AB 2473	Committee	Wildfire Forecast and Threat Intelligence Integration Center: emergency proclamation recommendation.		03/09/2026 - Referred to Com. on E.M.	03/09/2026 - Assembly Emergency Management			Low	Wildfire | Smoke | PSPS
AB 2513	Petrie-Norris	Wildfire: Regional Forest and Fire Capacity Program: local assistance grant program: regional landscape grants.		03/09/2026 - Referred to Coms. on NAT. RES. and W., P., & W.	03/09/2026 - Assembly Natural Resources			Low	Wildfire | Smoke | PSPS
AB 2586	Rodriguez, Celeste	Fire prevention: air quality and smoke monitoring.		02/21/2026 - From printer. May be heard in committee March 23.	02/20/2026 - Assembly PRINT			Low	Wildfire | Smoke | PSPS
SB 899	Grove	Fire prevention: Wildfire and Forest Resilience Task Force: wildfire smoke.	3/2/2026	03/02/2026 - From committee with author's amendments. Read second time and amended. Re-referred to Com. on N.R. & W.	02/11/2026 - Senate Natural Resources and Water			Low	Wildfire | Smoke | PSPS
SB 973	Becker	Wildfire County Coordinator Program.		02/18/2026 - Referred to Coms. on N.R. & W. and E.M.	02/18/2026 - Senate Natural Resources and Water			Medium	Wildfire | Smoke | PSPS
SB 1270	Richardson	Wildfire mitigation program: financial assistance to counties.		03/04/2026 - Referred to Coms. on E.M. and N.R. & W.	03/04/2026 - Senate Emergency Management			Low	Wildfire | Smoke | PSPS
Total Active Bills	**161**						**Low:** **Medium:** **High:**	**141** **17** **3**	

AB 907 **(Chen, R) State Air Resources Board: board members: compensation.**

Current Text: 02/19/2025 - Introduced **HTML** **PDF**

Introduced: 02/19/2025

Status: 07/17/2025 - Failed Deadline pursuant to Rule 61(a)(10). (Last location was E.Q. on 6/18/2025)(May be acted upon Jan 2026)



Location: 07/17/2025 - Senate 2 YEAR

Summary: Current law establishes the State Air Resources Board consisting of 14 members with 12 members appointed by the Governor, with the consent of the Senate. Current law provides that, of the 12 members appointed by the Governor, 6 of those members are to be from certain air quality management districts or air pollution control districts, as provided. In addition to the 14 members of the state board, current law provides that 2 Members of the Legislature serve on the state board as ex officio, nonvoting members of the state board. Current law provides that members appointed as members from the air districts serve on the state board without compensation. This bill would repeal the prohibition on compensation of the members of the state board from air districts and would specify that those members are to receive the annual salary provided to other members of the state board. The bill would repeal the per diem amount provided to elected official members of the state board. (Based on 02/19/2025 text)

Is Urgency: N

Is Fiscal: Y

Votes:

04/07/25 - **ASM. NAT. RES.** (Y:14 N:0 A:0) (P)
05/23/25 - **ASM. APPR.** (Y:14 N:0 A:1) (P)
06/03/25 - **ASM. THIRD READING** (Y:49 N:6 A:24) (P)

Text History:

02/19/25 - Introduced **htm** **pdf** **doc** **atl**

History:

06/18/2025 - Referred to Com. on E.Q.
06/04/2025 - In Senate. Read first time. To Com. on RLS. for assignment.
06/03/2025 - Read third time. Passed. Ordered to the Senate. (Ayes 49. Noes 6. Page 2032.)
05/27/2025 - Read second time. Ordered to third reading.
05/23/2025 - From committee: Do pass. (Ayes 14. Noes 0.) (May 23).
04/23/2025 - In committee: Set, first hearing. Referred to suspense file.
04/08/2025 - Coauthors revised. From committee: Do pass and re-refer to Com. on APPR. with recommendation: To Consent Calendar. (Ayes 14. Noes 0.) (April 7). Re-referred to Com. on APPR.
03/03/2025 - Referred to Com. on NAT. RES.
02/20/2025 - From printer. May be heard in committee March 22.
02/19/2025 - Read first time. To print.

Position: Support

Priority: Medium

Notes:

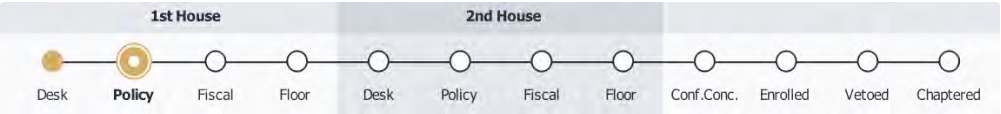
Board Approval
2/5/2025

AB 1777 **(Garcia, D) Air pollution: indirect sources.**

Current Text: 02/09/2026 - Introduced **HTML** **PDF**

Introduced: 02/09/2026

Status: 02/23/2026 - Referred to Com. on NAT. RES.



Location: 02/23/2026 - Assembly Natural Resources

Summary: Current law designates the State Air Resources Board as the state agency with the primary responsibility for the control of vehicular air pollution, and air pollution control districts and air quality management districts with the primary responsibility for the control of air pollution from all sources other than vehicular sources.

Current law authorizes air districts to adopt and implement regulations to reduce or mitigate emissions from indirect sources of air pollution. Current law requires the state board to adopt rules and regulations relating to vehicular emissions standards, as specified, that will achieve the ambient air quality standards required by federal law in conjunction with other measures adopted by the state board, air districts, and the United States Environmental Protection Agency. This bill would authorize the state board, if necessary to carry out that duty to achieve those ambient air quality standards, to adopt regulations to reduce or mitigate emissions from indirect sources of pollution. (Based on 02/09/2026 text)

Is Urgency: N

Is Fiscal: Y

Text History:
02/09/26 - Introduced (Published 02/09/26 9:00p.m.) **htm pdf doc atl**

History:
02/23/2026 - Referred to Com. on NAT. RES.
02/10/2026 - From printer. May be heard in committee March 12.
02/09/2026 - Read first time. To print.

Position: Support

Priority: Medium

Notes:
Board Approval
3/4/2026

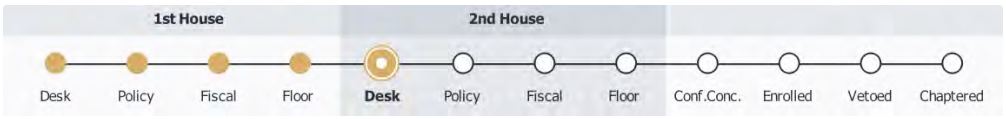
SB 222 **(Wiener, D) Residential heat pump systems: water heaters and HVAC: installations.**

Current Text: 01/15/2026 - Amended **HTML PDF**

Introduced: 01/27/2025

Last Amended: 01/15/2026

Status: 01/26/2026 - Read third time. Passed. (Ayes 29. Noes 8.) Ordered to the Assembly. In Assembly. Read first time. Held at Desk.



Location: 01/26/2026 - Assembly DESK

Summary: Current law requires the State Energy Resources Conservation and Development Commission, on or before January 1, 2019, in consultation with the Contractors State License Board, local building officials, and other stakeholders, to approve a plan that promotes compliance with specified regulations relating to building energy efficiency standards in the installation of central air-conditioning and heat pumps, as specified. Current law authorizes the commission to adopt regulations to increase compliance with permitting and inspection requirements for central air-conditioning and heat pumps, and associated sales and installations, consistent with the above-described plan. The bill would require a city, county, or city and county, beginning July 1, 2027, to adopt and offer asynchronous inspections for installations of residential heat pump water heater or heat pump HVAC systems, as defined, that do not require a licensed contractor and building inspector to be simultaneously present during the inspection. The bill would authorize a building inspector to contact the licensed contractor who performed the installation by telephone call or real-time video conferencing during their inspection, and, if the building inspector determines during an asynchronous inspection that there is an issue with an installation of the heat pump water heater or heat pump HVAC system and that the licensed contractor who performed the installation must be present to perform tests or cure the installation, to require the licensed contractor who performed the installation to schedule an additional inspection in which the building inspector and the licensed contractor who performed the installation are required to be simultaneously present during the additional inspection. (Based on 01/15/2026 text)

Is Urgency: N

Is Fiscal: Y

Votes:
04/08/25 - **SEN. JUD.** (Y:10 N:0 A:3) (P)
04/08/25 - **SEN. JUD.** (Y:5 N:2 A:6) (F)
01/06/26 - **SEN. HOUSING** (Y:10 N:0 A:1) (P)
01/14/26 - **SEN. L. GOV.** (Y:4 N:1 A:2) (P)
01/26/26 - **SEN. Senate 3rd Reading** (Y:29 N:8 A:3) (P)

Text History:
01/15/26 - Amended (Published 01/15/26 9:00p.m.) **htm pdf doc atl**
01/05/26 - Amended (Published 01/05/26 2:00p.m.) **htm pdf doc atl**
03/28/25 - Amended **htm pdf doc atl**
01/27/25 - Introduced **htm pdf doc atl**

History:
01/26/2026 - Read third time. Passed. (Ayes 29. Noes 8. Page 3279.) Ordered to the Assembly. In Assembly. Read first time. Held at Desk.
01/21/2026 - Read second time. Ordered to third reading.
01/20/2026 - From committee: Be ordered to second reading pursuant to Senate Rule 28.8.
01/15/2026 - Read second time and amended. Re-referred to Com. on APPR. Set for hearing January 20.
01/14/2026 - From committee: Do pass as amended and re-refer to Com. on APPR. (Ayes 4. Noes 1. Page 3224.) (January 14).
01/08/2026 - Set for hearing January 14.
01/07/2026 - From committee: Do pass and re-refer to Com. on L. GOV. (Ayes 10. Noes 0. Page 3183.) (January 6). Re-referred to Com. on L. GOV.
01/05/2026 - Set for hearing January 6 in HOUSING pending receipt. From committee with author's amendments. Read second time and amended. Re-referred to Com. on JUD. Withdrawn from committee. Re-referred to Com. on RLS. Re-referred to Coms. on HOUSING and L. GOV.
04/08/2025 - April 8 set for first hearing. Failed passage in committee. (Ayes 5. Noes 2. Page 705.) Reconsideration granted.
03/28/2025 - From committee with author's amendments. Read second time and amended. Re-referred to Com. on JUD.
03/25/2025 - Set for hearing April 8.
02/05/2025 - Referred to Coms. on JUD. and INS.
01/28/2025 - From printer. May be acted upon on or after February 27.
01/27/2025 - Introduced. Read first time. To Com. on RLS. for assignment. To print.

Position: Air District Co-Sponsor
Priority: High
Notes:
Board Approval 2/4/2026

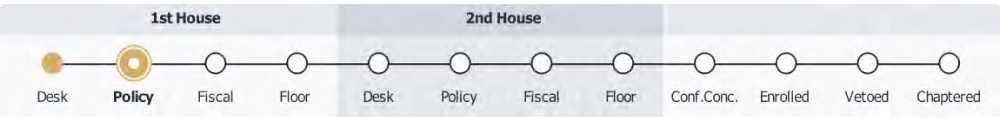
Total Measures: 3
Total Tracking Forms: 3

AB 2046 **(Ransom, D) Vehicles: pollution control devices.**

Current Text: 02/17/2026 - Introduced **HTML** **PDF**

Introduced: 02/17/2026

Status: 03/02/2026 - Referred to Com. on TRANS.



Location: 03/02/2026 - Assembly Transportation

Summary: Current law prohibits a person from operating or leaving standing upon a highway a motor vehicle that is required to be equipped with a motor vehicle pollution control device or any other certified motor vehicle pollution control device, as specified, unless the motor vehicle is equipped with the required motor vehicle pollution control device that is correctly installed and in operating condition, and prohibits a person from disconnecting, modifying, or altering that device. Current law also prohibits a person from installing, selling, offering for sale, or advertising any device, apparatus, or mechanism intended for use with, or as a part of, a required motor vehicle pollution control device or system that alters or modifies the original design or performance of the motor vehicle pollution control device or system. Current law exempts from these provisions an alteration, modification, or modifying device, apparatus, or mechanism found by resolution of the State Air Resources Board to not reduce the effectiveness of a required motor vehicle pollution control device or to result in emissions from the modified or altered vehicle that comply with existing state or federal standards, as specified. This bill would additionally exempt from the above-described provisions an alternative fuel retrofit system for a light-duty or medium-duty gasoline-fueled vehicle that converts the vehicle to a dual-fueled vehicle that can utilize gasoline or E85 fuel if the alternative fuel retrofit system has been certified by the United States Environmental Protection Agency as a clean alternative fuel conversion system, as specified, and would prohibit the State Air Resources Board from requiring state certification, executive order approval, or any additional testing or demonstration for such an alternative fuel retrofit device. (Based on 02/17/2026 text)

Is Urgency: N

Is Fiscal: Y

History:

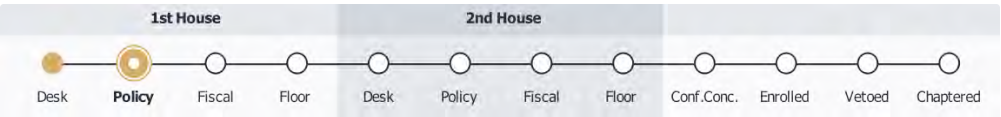
03/02/2026 - Referred to Com. on TRANS.
02/18/2026 - From printer. May be heard in committee March 20.
02/17/2026 - Read first time. To print.

AB 2102 **(DeMaio, R) Wildfire: vegetation management: fuel reduction activities.**

Current Text: 02/18/2026 - Introduced **HTML** **PDF**

Introduced: 02/18/2026

Status: 03/09/2026 - Referred to Coms. on NAT. RES. and E.M.



Location: 03/09/2026 - Assembly Natural Resources

Summary: Current law establishes in the Natural Resources Agency the Department of Forestry and Fire Protection, and requires the department to be responsible for, among other things, fire protection and prevention, as provided. Current law describes state responsibility areas as areas of the state in which the financial responsibility of preventing and suppressing fires has been determined by the State Board of Forestry and Fire Protection to be primarily the responsibility of the state. Current law requires the State Fire Marshal to classify lands within state responsibility areas into fire hazard severity zones and, by regulation, designate fire hazard severity zones and assign to each zone a rating reflecting the degree of severity of fire hazard that is expected to prevail in the zone, as provided. Current law also requires the State Fire Marshal to identify areas of the state as moderate, high, and very high fire hazard severity zones based on specified criteria. Current law requires, within 120 days of receiving a recommendation from the State Fire Marshal that identifies fire hazard severity zones, described above, a local agency to designate, by ordinance, fire hazard severity zones in its jurisdiction, as provided. This bill would, on or before January 1, 2028, and every 2 years thereafter, require the department or a local entity to conduct an assessment, as provided, of all undeveloped public lands for which it is primarily responsible for preventing and suppressing fires to ensure that the public land is not a severe fire hazard. The bill would require this assessment to be posted on the department's and local entity's internet website and would require a local entity conducting the assessment to submit its assessment to the department. The bill would

require all public lands, on or before January 1, 2028, to have 200-foot firebreaks on all borders with private property. (Based on 02/18/2026 text)

Is Urgency: N

Is Fiscal: Y

History:

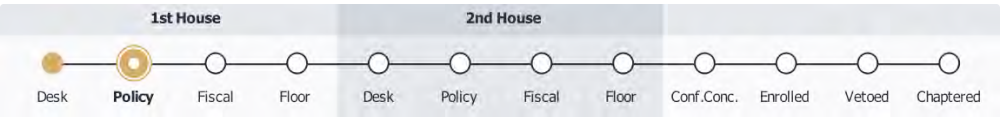
03/09/2026 - Referred to Coms. on NAT. RES. and E.M.
02/19/2026 - From printer. May be heard in committee March 21.
02/18/2026 - Read first time. To print.

AB 2635 **(Rodriguez, Celeste, D) Air pollution: small off-road engines: rebate programs: local regulation.**

Current Text: 02/20/2026 - Introduced **HTML** **PDF**

Introduced: 02/20/2026

Status: 03/09/2026 - Referred to Com. on NAT. RES.



Location: 03/09/2026 - Assembly Natural Resources

Summary: Existing law requires the State Air Resources Board, by July 1, 2022, consistent with federal law, to adopt cost-effective and technologically feasible regulations to prohibit engine exhaust and evaporative emissions from new small off-road engines, as defined by the state board. Existing law requires those regulations to apply to engines produced on or after January 1, 2024, or as soon as the state board determines is feasible, whichever is later, and requires the state board to identify, and, to the extent feasible, make available, funding for commercial rebates or similar incentive funding, as specified. This bill would require each air pollution control and air quality management district, no later than January 1, 2028, to implement and maintain a commercial rebate program to support the transition to zero-emission small off-road equipment consistent with specified requirements. By requiring districts to establish a new program, the bill would impose a state-mandated local program. This bill contains other related provisions and other existing laws. (Based on 02/20/2026 text)

Is Urgency: N

Is Fiscal: Y

History:

03/09/2026 - Referred to Com. on NAT. RES.
02/21/2026 - From printer. May be heard in committee March 23.
02/20/2026 - Read first time. To print.

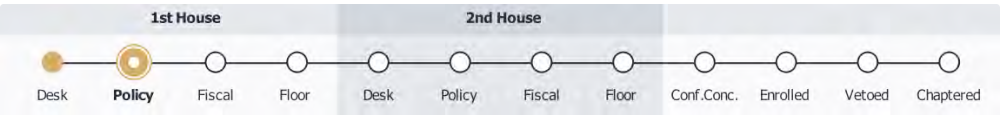
SB 875 **(Wiener, D) Public utilities: eminent domain.**

Current Text: 02/24/2026 - Amended **HTML** **PDF**

Introduced: 01/06/2026

Last Amended: 02/24/2026

Status: 03/04/2026 - Re-referred to Coms. on JUD. and E., U & C.



Location: 03/04/2026 - Senate Judiciary

Summary: The Eminent Domain Law authorizes a public entity to exercise the power of eminent domain to acquire property for a public use if the use for which the property is sought to be taken is a more necessary public use than the use to which the property is appropriated, as specified. Existing law specifies that if property has been appropriated to public use by any person other than a public entity, the use of the property by a public entity for the same or any other public use is a more necessary use than the current use. Current law also specifies that if property that has been appropriated to a public use is electrical, gas, or water public utility property, as defined, that the public entity intends to put to the same use, the presumption of a more necessary use is a rebuttable presumption affecting the burden of proof, except as specified. Current law requires a court to award a defendant their litigation expenses if the eminent domain proceeding is dismissed or if there is a final judgment that the plaintiff cannot acquire the property by eminent domain, as provided. This bill would specify that if property that has been appropriated to a public use is electrical, gas, or water public utility property that a public entity within the Pacific Gas and Electric Company service area intends to put to the same use, the presumption of a more necessary use is conclusive and not rebuttable. (Based on 02/24/2026 text)

Is Urgency: N

Is Fiscal: Y

History:

03/04/2026 - Re-referred to Coms. on JUD. and E., U & C.

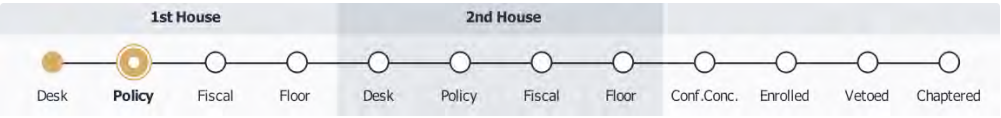
02/24/2026 - From committee with author's amendments. Read second time and amended. Re-referred to Com. on RLS.
02/11/2026 - Referred to Com. on RLS.
01/07/2026 - From printer. May be acted upon on or after February 6.
01/06/2026 - Introduced. Read first time. To Com. on RLS. for assignment. To print.

SB 1075 **(Reyes, D) Air resources: toxic air contaminants: criteria air pollutants: community emissions reduction programs.**

Current Text: 02/13/2026 - Introduced **HTML** **PDF**

Introduced: 02/13/2026

Status: 02/26/2026 - Referred to Com. on RLS.



Location: 02/13/2026 - Senate Rules

Summary: Current law requires the State Air Resources Board to prepare a statewide strategy to reduce emissions of toxic air contaminants and criteria air pollutants in communities affected by a high cumulative exposure burden that includes an assessment and identification of those communities. Current law requires the state board, based on the assessment and identification, to select locations around the state for preparation of community emissions reduction programs. Current law requires the regional air quality management district or the regional air pollution control district encompassing the location selected by the state board, within one year of selection, to adopt a community emissions reduction program to achieve emissions reductions for the location selected using cost-effective measures, as provided. This bill would make nonsubstantive changes to the above-described provisions. (Based on 02/13/2026 text)

Is Urgency: N

Is Fiscal: N

History:

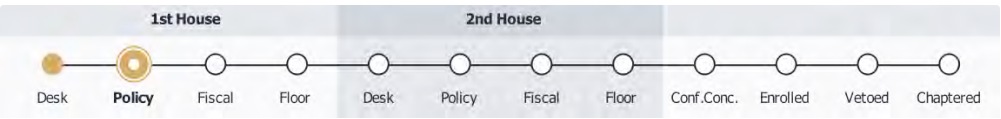
02/26/2026 - Referred to Com. on RLS.
02/17/2026 - From printer. May be acted upon on or after March 16.
02/13/2026 - Introduced. Read first time. To Com. on RLS. for assignment. To print.

SB 1097 **(Wiener, D) Energy: permit streamlining.**

Current Text: 02/13/2026 - Introduced **HTML** **PDF**

Introduced: 02/13/2026

Status: 02/26/2026 - Referred to Com. on RLS.



Location: 02/13/2026 - Senate Rules

Summary: Current law vests the State Energy Resources Conservation and Development Commission with exclusive jurisdiction to certify thermal powerplants, as defined. This bill would state the intent of the Legislature to enact subsequent legislation to streamline the permitting of energy generation, storage, and transmission projects given the increasing cost of energy and the need to quickly electrify to mitigate the impacts of climate change. (Based on 02/13/2026 text)

Is Urgency: N

Is Fiscal: N

History:

02/26/2026 - Referred to Com. on RLS.
02/17/2026 - From printer. May be acted upon on or after March 16.
02/13/2026 - Introduced. Read first time. To Com. on RLS. for assignment. To print.

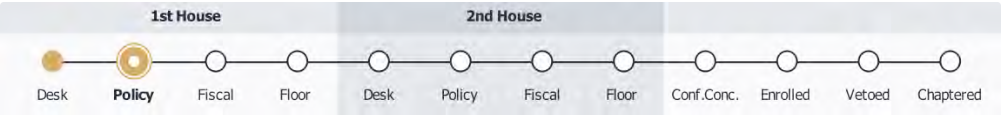
SB 1259 **(Blakespear, D) Refineries: decommissioning and remediation: cost estimates.**

Current Text: 02/19/2026 - Introduced **HTML** **PDF**

Introduced: 02/19/2026 (Spot bill)

Status: 03/04/2026 - Referred to Coms. on E.Q. and E., U & C.

Calendar: ***04/08/26 S-ENVIRONMENTAL QUALITY 9 a.m. - State Capitol, Room 112 BLAKESPEAR, CATHERINE, Chair***



Location: 03/04/2026 - Senate Environmental Quality

Summary: Under existing law, the State Water Resources Control Board and the California regional water quality control boards prescribe waste discharge requirements in accordance with the Federal Water Pollution Control Act and the Porter-Cologne Water Quality Control Act. This bill would require, on or before an unspecified date, the board, in consultation with specified entities, to develop guidelines for estimating the costs and timelines associated with decommissioning a refinery, as defined, and soil and groundwater remediation at refinery sites. The bill would require, on or before an unspecified date, each refiner, as defined, with an operating refinery to submit a report, including an estimate of the refinery's asset retirement obligations and a plan for meeting those obligations, to the board in accordance with those guidelines. The bill would require the commission to incorporate the information contained in the reports in its ongoing work to develop a comprehensive transportation fuels transition strategy. The bill would require the board to provide a copy of the report to the commission for that purpose. This bill contains other existing laws. (Based on 02/19/2026 text)

Is Urgency: N

Is Fiscal: Y

History:

03/04/2026 - Referred to Coms. on E.Q. and E., U & C.
02/20/2026 - From printer. May be acted upon on or after March 22.
02/19/2026 - Introduced. Read first time. To Com. on RLS. for assignment. To print.

Total Measures: 7
Total Tracking Forms: 3

ASSEMBLY BILL No. 1791

Introduced by Assembly Member Sanchez

February 10, 2026

An act to add Sections 39616.6 and 40440.9 to the Health and Safety Code, relating to air resources.

LEGISLATIVE COUNSEL'S DIGEST

AB 1791, as introduced, Sanchez. State Air Resources Board: South Coast Air Quality Management District: regulations: prohibition: costs.

The California Global Warming Solutions Act of 2006 designates the State Air Resources Board as the state agency charged with monitoring and regulating sources of emissions of greenhouse gases.

This bill would prohibit the state board from adopting any regulation or rule that would add more than $0.02 to the cost of a gallon of gasoline or add $2,000 or more to the cost to build any home. The bill would require the state board to submit data to the relevant policy committees of the Legislature that demonstrates how a proposed regulation is compliant with this prohibition.

Existing law, the Lewis-Presley Air Quality Management Act, establishes the South Coast Air Quality Management District in those portions of the Counties of Los Angeles, Orange, Riverside, and San Bernardino included within the South Coast Air Basin as the local agency with the responsibility for comprehensive air pollution control within the basin.

This bill would prohibit the south coast district from adopting any regulation or rule that would add more than $0.02 to the cost of a gallon of gasoline, add $2,000 or more to the cost to build any home, or add $5,000 or more to the cost to build a nonresidential building. The bill

would require the south coast district to submit data to the relevant policy committees of the Legislature that demonstrates how a proposed regulation is compliant with this prohibition. To the extent it would impose additional duties on a local entity, this bill would impose a state-mandated local program.

The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement.

This bill would provide that, if the Commission on State Mandates determines that the bill contains costs mandated by the state, reimbursement for those costs shall be made pursuant to the statutory provisions noted above.

Vote: majority. Appropriation: no. Fiscal committee: yes. State-mandated local program: yes.

The people of the State of California do enact as follows:

SECTION 1. Section 39616.6 is added to the Health and Safety Code, to read:

39616.6. Notwithstanding any other law, the state board shall not adopt any regulation or rule that would add more than two cents ($0.02) to the cost of a gallon of gasoline or add two thousand dollars ($2,000) or more to the cost to build any home. The state board shall submit data to the relevant policy committees of the Legislature that demonstrates how a proposed regulation is compliant with this section.

SEC. 2. Section 40440.9 is added to the Health and Safety Code, to read:

40440.9. Notwithstanding any other law, the south coast district shall not adopt any regulation or rule that would add more than two cents ($0.02) to the cost of a gallon of gasoline, add two thousand dollars ($2,000) or more to the cost to build any home, or add five thousand dollars ($5,000) or more to the cost to build a nonresidential building. The south coast district shall submit data to the relevant policy committees of the Legislature that demonstrates how a proposed regulation is compliant with this section.

SEC. 3. If the Commission on State Mandates determines that this act contains costs mandated by the state, reimbursement to local agencies and school districts for those costs shall be made

pursuant to Part 7 (commencing with Section 17500) of Division 4 of Title 2 of the Government Code.

O

ASSEMBLY BILL No. 2313

Introduced by Assembly Member Berman

February 19, 2026

An act to add Section 785.3 to the Public Utilities Code, relating to energy.

LEGISLATIVE COUNSEL'S DIGEST

AB 2313, as introduced, Berman. Gas corporations: gas distribution service line replacements: alternatives.

Existing law vests the Public Utilities Commission with regulatory authority over public utilities, including gas corporations. Existing law requires, until January 1, 2031, gas corporations to submit to the commission an annual map that includes, among other things, the location of all potential gas distribution line replacement projects identified in its distribution integrity management plan and any foreseeable gas distribution pipeline replacements.

This bill, the Home Energy Choice Act, would require the commission, in a new or existing proceeding, to require each gas corporation to offer a Gas Distribution Service Line Replacement Alternatives Program, on or before January 1, 2028, to provide gas customers served by a gas distribution service line, planned or forecasted for replacement over the next 5 years, or prioritized for replacement by the commission, with a monetary incentive to deploy gas distribution service line replacement alternatives, as defined, and cease gas service to avoid the gas distribution service line replacement, as specified.

Under existing law, a violation of any order, decision, rule, direction, demand, or requirement of the commission is a crime.

Because a violation of a commission action implementing the bill's requirements would be a crime, the bill would impose a state-mandated local program.

The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement.

This bill would provide that no reimbursement is required by this act for a specified reason.

Vote: majority. Appropriation: no. Fiscal committee: yes. State-mandated local program: yes.

The people of the State of California do enact as follows:

SECTION 1. This act shall be known, and may be cited, as the "Home Energy Choice Act."

SEC. 2. (a) The Legislature finds and declares all of the following:

(1) Natural gas demand is already declining as California transitions away from natural gas to zero-emission electric alternatives to achieve the state's energy efficiency, climate, and air quality objectives.

(2) Without active planning and management, reduced demand for natural gas will result in higher gas rates, with a disproportionate burden on vulnerable customers.

(3) Alternatives that avoid new capital investment in the gas system should be pursued where feasible and cost-effective.

(4) California gas corporations replace thousands of gas distribution service lines each year, with the significant majority connected to a single gas meter.

(5) Gas distribution service line replacement costs are paid by all gas customers as capital costs over a period of at least 55 years.

(6) Gas customers are currently not given a choice regarding the replacement of service lines connected to their homes.

(7) A monetary incentive for a gas customer to voluntarily replace their gas appliances with electric alternatives in lieu of a planned service line replacement benefits the customer by helping enable the purchase of new zero-emission appliances, other gas ratepayers by avoiding the long-term capital costs of service line replacements, and California's climate and air quality objectives by reducing reliance on fossil gas combustion.

(b) It is the intent of the Legislature that the Public Utilities Commission establish a program requiring gas corporations to offer gas customers the choice to replace their gas appliances with electric alternatives and cease gas service as an alternative to a planned service line replacement through a monetary incentive no greater than the average avoided cost of service line replacement.

SEC. 3. Section 785.3 is added to the Public Utilities Code, to read:

785.3. (a) For purposes of this section, all of the following definitions apply:

(1) "Disadvantaged community" means a community identified pursuant to Section 39711 of the Health and Safety Code.

(2) "Eligible gas customer" means a gas customer served by a gas distribution service line that is planned or forecasted for replacement during the next five years or prioritized for replacement by the commission based on characteristics, including, but not limited to, age or material of the gas distribution service line.

(3) "Gas distribution service line" has the same meaning as "service line" as set forth in Section 192.3 of Title 49 of the Code of Federal Regulations.

(4) "Gas distribution service line replacement alternatives" means measures to provide gas customers with energy service that does not require connecting to the gas system, including replacement of gas appliances with electric alternatives, any wiring, panel upgrades, or remediation necessary for electric appliance installation, circuit sharing or other devices that can avoid a panel upgrade, and energy efficiency.

(5) "Load-serving entity" has the same meaning as defined in Section 380.

(6) "Program" means the Gas Distribution Service Line Replacement Alternatives Program.

(b) In a new or existing proceeding, the commission shall require each gas corporation to offer a Gas Distribution Service Line Replacement Alternatives Program on or before January 1, 2028. The program shall provide eligible gas customers with a monetary incentive to deploy gas distribution service line replacement alternatives and cease gas service to avoid a planned or forecasted gas distribution service line replacement.

(c) Costs approved for gas distribution service line replacement by the commission may be used to fund incentives for gas distribution service line replacement alternatives. The cost-recovery period for redirected funds shall be no longer than 10 years.

(d) In administering the program, the commission shall establish all of the following:

(1) A standard incentive level for the deployment of gas distribution service line replacement alternatives no greater than the average lifetime cost of an avoided gas distribution service line replacement.

(2) Notice requirements for eligible gas customers. Notice shall include information about the climate and health benefits of zero-emission buildings, and the potential availability of additional incentives from other gas corporation and nongas corporation programs.

(3) A process for program implementation, including, but not limited to, potential use of a third-party program administrator, development of a preapproved list of contractors, development of a program internet website through which gas customers can determine their eligibility for the program, coordination with electrical corporations, local publicly owned electric utilities, load-serving entities, and local governments, and a requirement that a gas customer receiving incentives for gas distribution service line replacement alternatives close their gas account and request removal of their gas meter.

(4) Additional outreach requirements for gas distribution service line replacements in disadvantaged communities.

(5) Coordination with low-income energy efficiency and electrification programs to maximize available incentives for low-income customers.

SEC. 4. No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution because the only costs that may be incurred by a local agency or school district will be incurred because this act creates a new crime or infraction, eliminates a crime or infraction, or changes the penalty for a crime or infraction, within the meaning of Section 17556 of the Government Code, or changes the definition of a crime within

the meaning of Section 6 of Article XIII B of the California Constitution.

O

ASSEMBLY BILL No. 2752

Introduced by Assembly Member Ávila Farías

February 20, 2026

An act relating to air pollution.

LEGISLATIVE COUNSEL'S DIGEST

AB 2752, as introduced, Ávila Farías. Air quality management districts: oversight.

Existing law establishes the Bay Area Air Quality Management District, which is vested with the authority to regulate air emissions located in the boundaries of the Counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara and portions of the Counties of Solano and Sonoma.

Under existing law, the Lewis-Presley Air Quality Management Act establishes the South Coast Air Quality Management District in those portions of the Counties of Los Angeles, Orange, Riverside, and San Bernardino included within the South Coast Air Basin, as the local agency with the responsibility for comprehensive air pollution control within the basin.

This bill would state the intent of the Legislature to enact future legislation to ensure accountability and oversight of the Bay Area Air Quality Management District and the South Coast Air Quality Management District to ensure the rules and regulations they adopt are cost effective, affordable, and achievable.

Vote: majority. Appropriation: no. Fiscal committee: no. State-mandated local program: no.

The people of the State of California do enact as follows:

SECTION 1. It is the intent of the Legislature to enact subsequent legislation to ensure accountability and oversight of the Bay Area Air Quality Management District and the South Coast Air Quality Management District to ensure the rules and regulations they adopt are cost effective, affordable, and achievable.

O

AMENDED IN SENATE JANUARY 14, 2026

AMENDED IN SENATE JANUARY 5, 2026

AMENDED IN SENATE MAY 7, 2025

SENATE BILL No. 299

Introduced by Senator Cabaldon
(Coauthor: Senator Pérez)

February 10, 2025

An act to ~~amend~~ *add* Section ~~21080.69 of~~ *21080.68 to* the Public Resources Code, relating to environmental quality.

LEGISLATIVE COUNSEL'S DIGEST

SB 299, as amended, Cabaldon. California Environmental Quality Act: exemption: day care center: *family daycare home:* zoning.

The California Environmental Quality Act (CEQA) requires a lead agency, as defined, to prepare, or cause to be prepared, and certify the completion of an environmental impact report on a project that it proposes to carry out or approve that may have a significant effect on the environment or to adopt a negative declaration if it finds that the project will not have that effect. CEQA also requires a lead agency to prepare a mitigated negative declaration for a project that may have a significant effect on the environment if revisions in the project would avoid or mitigate that effect and there is no substantial evidence that the project, as revised, would have a significant effect on the environment.

Existing law exempts specified projects from CEQA, including a project that consists exclusively of a day care center, as defined, that is not located in a residential area.

This bill would ~~instead provide that the above exemption from CEQA applies if the day care center is not located on a parcel of land zoned exclusively for residential use. The bill would additionally~~ exempt from CEQA a project that consists exclusively of a *day care center or a* family daycare home, as ~~defined.~~ *defined, that is located on a parcel of land zoned exclusively for residential use, except as provided.* By imposing additional duties on a lead agency to determine the applicability of these exemptions, the bill would impose a state-mandated local program.

The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement.

This bill would provide that no reimbursement is required by this act for a specified reason.

Vote: majority. Appropriation: no. Fiscal committee: yes. State-mandated local program: yes.

The people of the State of California do enact as follows:

~~SECTION 1. Section 21080.69 of the Public Resources Code is amended to read:~~

~~21080.69. (a) Except as provided in subdivision (b), this division does not apply to any of the following projects:~~

~~(1) A project that consists exclusively of a day care center, as defined in Section 1596.76 of the Health and Safety Code, that is not located on a parcel of land zoned exclusively for residential use.~~

~~(2) A project that consists exclusively of a family daycare home, as defined in Section 1596.78 of the Health and Safety Code.~~

~~(3) A project that consists exclusively of a rural health clinic, as defined by Section 1396(d)(*l*)(1) of Title 42 of the United States Code, or a federally qualified health center, as defined by Section 1396(d)(*l*)(2) of Title 42 of the United States Code, if the facility is less than 50,000 square feet in total space.~~

~~(4) A project that consists exclusively of a nonprofit food bank or food pantry, defined as a nonprofit organization that is exempt from federal income taxation under Section 501(c)(3) of the Internal Revenue Code of 1986, as amended (26 U.S.C. Sec. 501(c)(3)), that solicits, stores, and distributes sufficient food to~~

~~their defined service area, if the project is located on a site that is zoned exclusively for industrial uses.~~

~~(5) A project that consists exclusively of a facility for advanced manufacturing, as defined in Section 26003, if the project is located on a site zoned exclusively for industrial uses.~~

~~(b) This section does not apply to a project located on natural and protected lands, as defined pursuant to Section 21067.5.~~

SECTION 1. Section 21080.68 is added to the Public Resources Code, to read:

21080.68. (a) This division does not apply to the following projects:

(1) A project that consists exclusively of a day care center, as defined in Section 1596.76 of the Health and Safety Code, that is located on a parcel of land zoned exclusively for residential use.

(2) A project that consists exclusively of a family daycare home, as defined in Section 1596.78 of the Health and Safety Code, that is located on a parcel of land zoned exclusively for residential use.

(b) This section does not apply to a project located within 3,200 feet of a facility that actively extracts or refines oil or natural gas.

(c) This section does not apply to a project located on natural and protected lands, as defined pursuant to Section 21067.5.

SEC. 2. No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution because a local agency or school district has the authority to levy service charges, fees, or assessments sufficient to pay for the program or level of service mandated by this act, within the meaning of Section 17556 of the Government Code.

O

SENATE BILL No. 954

Introduced by Senator Blakespear

February 2, 2026

An act relating to environmental quality.

LEGISLATIVE COUNSEL'S DIGEST

SB 954, as introduced, Blakespear. California Environmental Quality Act: exemptions: natural and protected lands: advanced manufacturing: childcare facilities.

The California Environmental Quality Act (CEQA) requires a lead agency, as defined, to prepare, or cause to be prepared, and certify the completion of an environmental impact report on a project that it proposes to carry out or approve that may have a significant effect on the environment or to adopt a negative declaration if it finds that the project will not have that effect. CEQA also requires a lead agency to prepare a mitigated negative declaration for a project that may have a significant effect on the environment if revisions in the project would avoid or mitigate that effect and there is no substantial evidence that the project, as revised, would have a significant effect on the environment. CEQA exempts specified projects, including, among other things, projects for advanced manufacturing and childcare facilities, as provided, from its provisions.

This bill would provide that it is the intent of the Legislature to enact subsequent legislation that would amend provisions of CEQA relating to natural and protected lands, childcare facilities, and advanced manufacturing, among other changes, as provided.

Vote: majority. Appropriation: no. Fiscal committee: no. State-mandated local program: no.

The people of the State of California do enact as follows:

SECTION 1. It is the intent of the Legislature to enact subsequent legislation that would amend provisions of the law as enacted by Senate Bill 131 (Chapter 24 of the Statutes of 2025), relating to natural and protected lands, childcare facilities, and advanced manufacturing, among other changes.

O

SENATE BILL No. 1392

Introduced by Senators Cortese and Grove
(Coauthors: Senators Archuleta, Choi, Dahle, Niello, Ochoa Bogh, Richardson, Seyarto, Strickland, and Valladares)
(Coauthors: Assembly Members Alanis, Alvarez, Davies, Ellis, Gallagher, Jeff Gonzalez, Lackey, Patterson, and Michelle Rodriguez)

February 20, 2026

An act to amend Section 44011 of the Health and Safety Code, and to amend Section 259 of the Vehicle Code, relating to air pollution.

LEGISLATIVE COUNSEL'S DIGEST

SB 1392, as introduced, Cortese. Smog check: exemption: collector motor vehicles.

Existing law establishes a motor vehicle inspection and maintenance (smog check) program that is administered by the Department of Consumer Affairs. The smog check program requires inspection of motor vehicles upon initial registration, biennially upon renewal of registration, upon transfer of ownership, and in certain other circumstances. Existing law requires all motor vehicles to biennially obtain a certificate of compliance or noncompliance, as provided. Existing law exempts specified vehicles from obtaining the certificate of compliance or noncompliance, including, among others, all motor vehicles manufactured before the 1976 model year. Existing law also exempts from specified portions of the smog test, both biennially and at transfer, a collector motor vehicle that is insured as a collector motor vehicle, is at least 35 model years old, complies with the exhaust emissions standards for that motor vehicle's class and model year as prescribed by the department, and passes a functional inspection of the fuel cap and a visual inspection for liquid fuel leaks. Existing law defines collector motor vehicle for this purpose to mean a motor vehicle owned

by a collector, as defined, used primarily in shows, parades, charitable functions, and historical exhibitions for display, maintenance, preservation, and not used primarily for transportation.

This bill would redefine collector motor vehicle to mean a vehicle that is at least 35 years old, is used primarily in shows, parades, charitable functions, and historical exhibitions, as provided, and is not used as the owner's primary mode of transportation, and is insured as a collector motor vehicle, as specified. The bill would exempt a collector motor vehicle manufactured before the 1981 model year from the requirement to obtain a certificate of compliance or noncompliance. The bill would extend the applicability of this exemption by one model year each year, beginning on and after January 1, 2028, until the final extension takes effect on and after January 1, 2032, that would exempt a collector motor vehicle manufactured before the 1986 model year from the requirement to obtain the certificate of compliance or noncompliance.

Vote: majority. Appropriation: no. Fiscal committee: yes. State-mandated local program: no.

The people of the State of California do enact as follows:

SECTION 1. Section 44011 of the Health and Safety Code is amended to read:

44011. (a) All motor vehicles powered by internal combustion engines that are registered within an area designated for program coverage shall be required biennially to obtain a certificate of compliance or noncompliance, except for the following:

(1) All motorcycles until the department, pursuant to Section 44012, implements test procedures applicable to motorcycles.

(2) All motor vehicles that have been issued a certificate of compliance or noncompliance or a repair cost waiver upon a change of ownership or initial registration in this state during the preceding six months.

(3) All motor vehicles manufactured ~~prior to~~ *before* the 1976 ~~model-year.~~ *model year.*

(4) (A) Except as provided in subparagraph (B), all motor vehicles four or less ~~model-years~~ *model years* old.

(B) (i) Beginning January 1, 2005, all motor vehicles six or less ~~model-years~~ *model years* old, unless the state board finds that providing an exception for these vehicles will prohibit the state

from meeting the requirements of Section 176(c) of the federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.) or the state's commitments with respect to the state implementation plan required by the federal Clean Air Act.

(ii) Notwithstanding clause (i), beginning January 1, 2019, all motor vehicles eight or less ~~model-years~~ *model years* old, unless the state board finds that providing an exception for these vehicles will prohibit the state from meeting the requirements of Section 176(c) of the federal Clean Air Act (42 U.S.C. Sec. 7401 et seq.) or the state's commitments with respect to the state implementation plan required by the federal Clean Air Act.

(iii) Clause (ii) does not apply to a motor vehicle that is seven ~~model-years~~ *model years* old in year 2018 for which a certificate of compliance has been obtained.

(C) All motor vehicles excepted by this paragraph shall be subject to testing and to certification requirements as determined by the department, if any of the following apply:

(i) The department determines through remote sensing activities or other means that there is a substantial probability that the vehicle has a tampered emission control system or would fail for other cause a smog check test as specified in Section 44012.

(ii) The vehicle was previously registered outside this state and is undergoing initial registration in this state.

(iii) The vehicle is being registered as a specially constructed vehicle.

(iv) The vehicle has been selected for testing pursuant to Section 44014.7 or any other provision of this chapter authorizing out-of-cycle testing.

(D) This paragraph does not apply to diesel-powered vehicles.

(5) In addition to the vehicles exempted pursuant to paragraph (4), any motor vehicle or class of motor vehicles exempted pursuant to subdivision (c) of Section 44024.5. It is the intent of the Legislature that the department, pursuant to the authority granted by this paragraph, exempt at least 15 percent of the lowest emitting motor vehicles from the biennial smog check inspection.

(6) All motor vehicles that the department determines would present prohibitive inspection or repair problems.

(7) Any vehicle registered to the owner of a fleet licensed pursuant to Section 44020 if the vehicle is garaged exclusively

outside the area included in program coverage, and is not primarily operated inside the area included in program coverage.

(8) (A) All diesel-powered vehicles manufactured ~~prior to~~ *before* the 1998 ~~model year.~~ *model year.*

(B) All diesel-powered vehicles that have a gross vehicle weight rating of 8,501 to 10,000 pounds, inclusive, until the department, in consultation with the state board, pursuant to Section 44012, implements test procedures applicable to these vehicles.

(C) All diesel-powered vehicles that have a gross vehicle weight rating from 10,001 pounds to 14,000 pounds, inclusive, until the state board and the Department of Motor Vehicles determine the best method for identifying these vehicles, and until the department, in consultation with the state board, pursuant to Section 44012, implements test procedures applicable to these vehicles.

(D) All diesel-powered vehicles that have a gross vehicle weight rating of 14,001 pounds or greater.

(9) A collector motor vehicle manufactured before the 1981 model year.

(10) On and after January 1, 2028, a collector motor vehicle manufactured before the 1982 model year.

(11) On and after January 1, 2029, a collector motor vehicle manufactured before the 1983 model year.

(12) On and after January 1, 2030, a collector motor vehicle manufactured before the 1984 model year.

(13) On and after January 1, 2031, a collector motor vehicle manufactured before the 1985 model year.

(14) On and after January 1, 2032, a collector motor vehicle manufactured before the 1986 model year.

(b) Vehicles designated for program coverage in enhanced areas shall be required to obtain inspections from appropriate smog check stations operating in enhanced areas.

(c) For purposes of subdivision (a), a collector motor ~~vehicle, as defined in Section 259 of the Vehicle Code,~~ *vehicle* is exempt from those portions of the test required by subdivision (f) of Section 44012 if the collector motor vehicle meets all of the following criteria:

(1) Submission of proof that the motor vehicle is insured as a collector motor vehicle, as shall be required by regulation of the bureau.

(2) The motor vehicle is at least 35 ~~model-years~~ *model years* old.

(3) The motor vehicle complies with the exhaust emissions standards for that motor vehicle's class and ~~model-year~~ *model year* as prescribed by the department, and the motor vehicle passes a functional inspection of the fuel cap and a visual inspection for liquid fuel leaks.

(d) For purposes of this section, "collector motor vehicle" has the same meaning as defined in Section 259 of the Vehicle Code.

SEC. 2. Section 259 of the Vehicle Code is amended to read:

259. "Collector motor vehicle" means a motor vehicle ~~owned by a collector, as defined in subdivision (a) of Section 5051, and the motor vehicle is used primarily in shows, parades, charitable functions, and historical exhibitions for display, maintenance, and preservation, and is not used primarily for transportation.~~ *that meets all of the following criteria:*

(a) Is at least 35 model years old.

(b) Is used primarily in shows, parades, charitable functions, and historical exhibitions for display, maintenance, and preservation, and is not used as the owner's primary mode of transportation.

(c) Is insured as a collector motor vehicle with proof of insurance submitted to the department at the time of registration.

O

Bay Area Air District

State Legislative Updates

Policy, Grants, and Technology Committee

March 18, 2026

Alan Abbs
Legislative Officer
Legislative and Government Affairs Division

Abbreviations

- Assembly Bill (AB)
- Senate Bill (SB)
- California Air Resources Board (CARB)
- California Energy Commission (CEC)
- California Environmental Quality Act (CEQA)
- California Public Utilities Commission (CPUC)
- Heating, Ventilation, and Air Conditioning (HVAC)
- South Coast Air Quality Management District (South Coast AQMD)
- State Water Resources Control Board (State Water Board)
- United States Environmental Protection Agency (US EPA)

Recommended Action

Recommend to the Board of Directors that the Board adopt positions on pending state legislative bills where appropriate, including, but not limited to the following Air District staff recommendations:

SUPPORT	OPPOSE
AB 2313 (Berman)	**AB 1791 (Sanchez)**
SB 299 (Cabaldon)	**AB 2752 (Ávila Farías)**
SB 954 (Blakespear)	**SB 1392 (Cortese)**

2026 Legislative Session

Date/Deadline	Description
May 29, 2026	Last day for each house to pass bills introduced in that house
August 31, 2026	Last day for each house to pass bills
September 30, 2026	Last day for the Governor to sign or veto bills passed by the Legislature before September 1 and in the Governor's possession on or after September 1
November 3, 2026	General Election
November 30, 2026	Adjournment *sine die* at midnight
December 7, 2026	12 Noon convening of the 2027-28 Regular Session
January 1, 2027	Statutes take effect

Board-Approved-Position Bills

As of March 4, 2026

SB 222 (Wiener)

Heat Pump Access Act

This bill would make cost-saving, energy efficient heat pump water heater and HVAC installations faster, simpler and more affordable by streamlining the permitting process.

Position: Co-Sponsor (approved by the Board on February 4, 2026)

AB 907 (Chen)

State Air Resources Board: board members: compensation

The bill proposal would provide that CARB board members representing air districts receive the same level of compensation as other Governor-appointed voting CARB board members. Per current statute, Health and Safety Code Section 39512.5, air district CARB Board members only receive $100 per meeting plus actual and necessary expenses.

Position: Support (approved by the Board on February 5, 2025)

AB 1777 (Garcia)

Air pollution: indirect sources

This bill would authorize CARB, if necessary to carry out that duty to achieve those ambient air quality standards, to adopt regulations to reduce or mitigate emissions from indirect sources of pollution.

Position: Support (approved by the Board on March 4, 2026)

Air District Staff Recommendations

AB 1791 (Sanchez)

State Air Resources Board: South Coast AQMD: regulations: prohibition: costs

This bill would prohibit the South Coast AQMD from adopting any regulation or rule that would add more than $0.02 to the cost of a gallon of gasoline, add $2,000 or more to the cost to build any home, or add $5,000 or more to the cost to build a nonresidential building. The bill would require the South Coast AQMD to submit data to the relevant policy committees of the Legislature that demonstrates how a proposed regulation is compliant with this prohibition.

Staff Recommendation: Oppose

AB 2313 (Berman)

Gas corporations: gas distribution service line replacements: alternatives

This bill, the Home Energy Choice Act, would require the CPUC in a new or existing proceeding, to require each gas corporation to offer a Gas Distribution Service Line Replacement Alternatives Program, on or before January 1, 2028, to provide gas customers served by a gas distribution service line, planned or forecasted for replacement over the next 5 years, or prioritized for replacement by the commission, with a monetary incentive to deploy gas distribution service line replacement alternatives, as defined, and cease gas service to avoid the gas distribution service line replacement, as specified.

Staff Recommendation: Support

AB 2752 (Ávila Farías)

Air quality management districts: oversight

This bill states the intent of the Legislature to enact future legislation to ensure accountability and oversight of the Bay Area Air District and the South Coast AQMD to ensure the rules and regulations they adopt are cost effective, affordable, and achievable. This bill is currently an “intent bill” that will be amended in the future, however, whether a rule is “cost effective, affordable, and achievable” is currently covered by Health and Safety Code Section 40728.5 Required Assessment. Staff of the Assemblymember has indicated this is an industry-supported bill.

Staff Recommendation: Oppose

SB 299 (Cabaldon)

CEQA: exemption: day care center: family daycare home: zoning

This bill would provide that an exemption from CEQA applies to a day care center on a parcel of land zoned exclusively for residential use. This is another bill seeking to fix problems with the SB 131 trailer bill from 2025, which in this case provided a CEQA exemption for day care centers proposed on a parcel of land zoned as industrial, which ultimately made it easier to zone day care centers in industrial areas rather than residential areas.

Staff Recommendation: Support

SB 954 (Blakespear)

CEQA : exemptions: natural and protected lands: advanced manufacturing: childcare facilities

This spot bill will seek to amend SB 131 (Committee on Budget and Fiscal Review, Chapter 24, Statutes of 2025) – a budget trailer bill from 2025 – that provided broad CEQA exemptions for “advanced manufacturing facilities” which ended up including a long list of potential industrial activities.

Staff Recommendation: Support

SB 1392 (Cortese)

Smog check: exemption: collector motor vehicles

This bill would redefine “collector motor vehicle” in state law and further exempt a collector motor vehicle manufactured before the 1981 model year from the requirement to pass biennial smog check. The bill would extend the applicability of this exemption by one model year each year, beginning on and after January 1, 2028, until the final extension takes effect on and after January 1, 2032, that would exempt a collector motor vehicle manufactured before the 1986 model year from the requirement to obtain the certificate of compliance or noncompliance.

Staff Recommendation: Oppose

Additional Bills for Discussion

AB 2046 (Ransom)

Vehicles: pollution control devices

This bill would exempt alternative fuel retrofit system for a light-duty or medium-duty gasoline-fueled vehicle that converts the vehicle to a dual-fueled vehicle that can utilize gasoline or E85 fuel if the alternative fuel retrofit system has been certified by the US EPA as a clean alternative fuel conversion system, as specified, and would prohibit CARB from requiring state certification, executive order approval, or any additional testing or demonstration for such an alternative fuel retrofit device.

AB 2102 (DeMaio)

Wildfire: vegetation management: fuel reduction activities

The bill would make several changes to existing fuel reduction activities, including:

- Require all public lands, on or before January 1, 2028, to have 200-foot firebreaks on all borders with private property
- Wildfire fuel reduction activities pursuant to this section shall be exempt from CEQA
- A state agency, including, but not limited to, CARB or its successor entity, shall not impose additional permitting, emissions limitation, or regulatory requirements on activities conducted pursuant to this section
- A city, county, or special district shall not impose discretionary review, conditional use permits, or additional environmental review requirements for activities authorized by this part

AB 2635 (C. Rodriguez)

Air pollution: small off-road engines: rebate programs: local regulation

This bill would require each air pollution control and air quality management district, no later than January 1, 2028, to implement and maintain a commercial rebate program to support the transition to zero-emission small off-road equipment consistent with specified requirements. By requiring districts to establish a new program, the bill would impose a state-mandated local program. This bill contains other related provisions and other existing laws.

SB 875 (Wiener)

Public utilities: eminent domain

This bill would specify that if property that has been appropriated to a public use is electrical, gas, or water public utility property that a public entity within the Pacific Gas and Electric Company service area intends to put to the same use, the presumption of a more necessary use is conclusive and not rebuttable.

SB 1075 (Reyes)

Air resources: toxic air contaminants: criteria air pollutants: community emissions reduction programs

Spot Bill – No substantive language.

SB 1097 (Wiener)

Energy: permit streamlining

Intent Bill – No substantive language.

“This bill would state the intent of the Legislature to enact subsequent legislation to streamline the permitting of energy generation, storage, and transmission projects given the increasing cost of energy and the need to quickly electrify to mitigate the impacts of climate change.”

SB 1259 (Blakespear)

Refineries: decommissioning and remediation: cost estimate

The bill would require, on or before an unspecified date, each refiner, as defined, with an operating refinery to submit a report, including an estimate of the refinery's asset retirement obligations and a plan for meeting those obligations, to the State Water Board in accordance with those guidelines. The bill would require the CEC to incorporate the information contained in the reports in its ongoing work to develop a comprehensive transportation fuels transition strategy. The bill would require the State Water Board to provide a copy of the report to the CEC for that purpose. This bill contains other existing laws.

Recap: Recommended Action

Recommend to the Board of Directors that the Board adopt positions on pending state legislative bills where appropriate, including, but not limited to the following Air District staff recommendations:

SUPPORT	OPPOSE
AB 2313 (Berman)	**AB 1791 (Sanchez)**
SB 299 (Cabaldon)	**AB 2752 (Ávila Farías)**
SB 954 (Blakespear)	**SB 1392 (Cortese)**

Questions & Discussion

For more information:

Alan Abbs | Legislative Officer | aabbs@baaqmd.gov

BAY AREA AIR DISTRICT
Memorandum

To: Chairperson Vicki Veenker and Members
of the Policy, Grants, and Technology Committee

From: Philip M. Fine
Executive Officer/APCO

Date: March 18, 2026

Re: Update on Bay Area Regional Climate Action Plan

RECOMMENDED ACTION

None; the Committee will discuss this item, but no action is requested at this time.

BACKGROUND

In July 2023, the Air District received a $1 million Climate Pollution Reduction Grant from the United States Environmental Protection Agency (US EPA) to lead the development of a regional climate action plan. The Air District refers to this plan as the Bay Area Regional Climate Action Plan (BARCAP). The purpose of the BARCAP is to reduce greenhouse gas (GHG) emissions and other harmful air pollutants through measures that meaningfully benefit communities that bear the brunt of the impacts from fossil fuel dependence, referred to herein as frontline communities. It aims to also create jobs, spur economic growth, and enhance health and quality of life in the Bay Area.

The BARCAP planning region encompasses Alameda, Contra Costa, Marin, Napa, San Francisco, and San Mateo counties, and the portions of Solano and Sonoma counties that fall within the Air District's jurisdiction. Santa Clara County received its own US EPA grant to develop a climate action plan in partnership with San Benito County. Air District staff have worked in close coordination with staff leading the Santa Clara County climate planning effort.

Air District staff presented an update on the BARCAP to the Policy, Grants and Technology Committee (Committee) on March 19, 2025. The presentation included a high-level review of the regional GHG emissions inventory and early ideas for GHG reduction measures. On July 16, 2025, Air District staff presented another update on the BARCAP to the Committee, focused on draft GHG reduction measures. Santa Clara County also presented on its comprehensive climate action plan at this meeting.

DISCUSSION

The State of California and over 80 Bay Area cities and counties have adopted plans to aggressively fight climate change. The BARCAP adds to these efforts without duplicating what others are already doing, fills key gaps, and enables existing plans to be successfully implemented in ways that are efficient, equitable, and will benefit the whole region. As the Bay Area's first regional climate action plan, the BARCAP lays out a set of actionable and impactful strategies to accelerate the transition to a cleaner economy and the state's goal of a carbon-neutral future.

The Air District led development of the BARCAP in close collaboration with a regional Advisory Work Group, consisting of staff representatives from the Air District, the Metropolitan Transportation Commission/Association of Bay Area Governments (specifically, the Bay Area Regional Energy Network), the Bay Area Regional Collaborative, the counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Sonoma, the City of Oakland, as well as several community-based organizations including the Canal Alliance, Climate Resilient Communities, Emerald Cities Collaborative-Northern California, Rise South City, and Transform.

The Air District led a robust engagement process to collect information on community priorities, existing and planned policy and planning efforts, and technical challenges and opportunities. Through a series of interactive working sessions with technical stakeholders, community and public workshops, and input from local governments and the Advisory Work Group, Air District staff led the development of GHG reduction measures for all economic sectors (transportation, residential and commercial buildings, electricity (power) generation, waste and materials management, and agriculture/natural and working lands). While not required, the Air District provided a thirty-day public comment period on the draft measures. Air District staff summarized major comment themes and described how comments were addressed in a "BARCAP Summary Response to Public Comment" document that has been posted to the Air District website.

Analyses of the BARCAP measures include potential GHG emissions reduction, criteria pollutant reductions, impacts on frontline communities, workforce planning, and funding pathways.

Air District staff will present an overview of the BARCAP and the planned implementation next steps.

Staff from Santa Clara County will provide brief comments on the County's parallel climate action planning effort.

BUDGET CONSIDERATION/FINANCIAL IMPACT

The $1 million grant award is being allocated in the Air District's Fiscal Year End (FYE) 2025, FYE 2026, and FYE 2027 budgets.

Respectfully submitted,

Philip M. Fine
Executive Officer/APCO

Prepared by: Jamesine Rogers Gibson
Reviewed by: Wendy Goodfriend

ATTACHMENT(S):

1. Bay Area Regional Climate Action Plan
2. Appendix A - BARCAP Region Greenhouse Gas Emissions Inventory
3. Appendix B - 2022 Natural Working Lands Inventory
4. Appendix C - Technical Methodology for Quantifying GHGs, Co-pollutants, and Costs
5. Appendix D - Frontline Community Impacts Analysis
6. Appendix E - Engagement
7. Appendix F - Workforce Planning Analysis
8. Appendix G - Funding Roadmaps
9. Appendix H - Glossary
10. BARCAP Summary Response to Public Comment
11. Update on Bay Area Regional Climate Action Plan Presentation

Bay Area Air District



BAY AREA REGIONAL CLIMATE ACTION PLANNING INITIATIVE

Bay Area Regional Climate Action Plan

MARCH 2026

Land Acknowledgement

The land that makes up the eight-county BARCAP region is home to diverse groups of Indigenous peoples with unique cultures and deeply rooted relationships to the land for over 10,000 years. This land is unceded Indigenous land and the territories, or counties, the Bay Area Air District (Air District) represents are of the Indigenous people. To acknowledge this history of our country – that this nation was built on genocide, the exclusion and erasure of Indigenous people – grounds our work in truth. The Air District acknowledges the Ohlone as the traditional caretakers of the land – including the water and air that makes up the Bay Area. We honor their connection to the land and the deep respect they hold for this region.[1]

Ohlone is the most commonly used term for the predominant Indigenous group of the Bay Area, who are made up of linguistically similar but ethnically diverse Native American tribes. These tribes include the Chochenyo and the Karkin of the East Bay, the Ramaytush of San Francisco, the Yokuts of the South Bay and Central Valley, and the Muwekma tribe from throughout the region. Other Indigenous groups in the region distinct from the Ohlone linguistic group including the Coast Miwok and Southern Pomo of the Graton Rancheria community; the Kashaya, Patwin and Mishewal Wappo of the North Bay; and the Bay Miwok of the East Bay.[2,3]

Acknowledgements

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District staff members who contributed to the development of the Bay Area Regional Climate Action Plan include:

- **Abby Young,** Manager, Planning and Climate Protection
- **Abhinav Guha,** Principal Air Quality Engineer, Assessment, Inventory, and Modeling
- **Andrea Gordon,** Senior Environmental Planner, Planning and Climate Protection
- **Ariana Husain,** Manager, Engineering
- **Basilio Mendoza Juachon,** Intern, Planning and Climate Protection
- **Claire Thomas,** CivicSpark Fellow, Planning and Climate Protection
- **David Holstius,** Senior Advanced Projects Advisor, Assessment, Inventory, and Modeling
- **Ellie Porciuncula,** Assistant Staff Specialist II, Planning and Climate Protection
- **Forest Abbott-Lum,** Senior Environmental Planner, Planning and Climate Protection
- **Jamesine Rogers Gibson,** Senior Advanced Projects Advisor, Planning and Climate Protection
- **Joshua Abraham,** Assistant Manager, Environmental Justice
- **Monte DiPalma,** Senior Environmental Engineer, Planning and Climate Protection
- **Richard Chien,** Manager, Planning and Climate Protection
- **Sally Newman,** Senior Air Quality Specialist, Planning and Climate Protection
- **Sienna Marley,** Assistant Staff Specialist, Planning and Climate Protection
- **Song Bai,** Director, Assessment, Inventory, and Modeling
- **Wendy Goodfriend,** Director, Planning and Climate Protection

Advisory Work Group Member Organizations:

- **Aleka Seville,** Regional Coordination Advisor, Bay Area Regional Energy Network
- **Allison Brooks,** Executive Director, Bay Area Regional Collaborative
- **Avana Andrade,** Senior Sustainability Coordinator, San Mateo County Office of Sustainability
- **Carrie Harvilla,** Deputy Director, Transform
- **Chirag Rabari,** Assistant Director, Metropolitan Transportation Commission
- **Cyndy Comerford,** Climate Program Manager, SF Environment
- **Dana Armanino,** Planning Manager, County of Marin
- **Elizabeth Stampe,** Senior Climate Action Coordinator, SF Environment
- **Jamesine Rogers Gibson,** Senior Advanced Program Advisor, Bay Area Air District
- **Jane Elias,** Program Administrator, Bay Area Regional Energy Network
- **Jody London,** Sustainability Coordinator, Contra Costa County
- **Josh Bradt,** Program Coordinator, Bay Area Regional Collaborative (BARC)
- **Julio Garcia,** Executive Director, Rise South City
- **Kim Springer,** Transportation Systems Coordinator, City/County Association of Governments of San Mateo County
- **Krute Singa,** Principal Regional Planner, Metropolitan Transportation Commission
- **Megan Leary,** Community Engagement and Policy Manager, Emerald Cities Collaborative Northern California
- **Miya Kitahara,** Program Manager, Alameda County Waste Management Authority (StopWaste)
- **Omar Carrera,** CEO, Canal Alliance
- **Ryan Melendez,** Sustainability Planner, Napa County
- **Shayna Hirshfield-Gold,** Climate Program Manager, City of Oakland
- **Tanya Nareth,** Chief Deputy Executive Officer, Sonoma County Regional Climate Protection Authority
- **Violet Wulf-Saena,** Founder and Executive Director, Climate Resilient Communities



Acronyms

AB: Assembly Bill

ABAG: Association of Bay Area Governments

ACC II: Advanced Clean Cars II

AEA: Association for Energy Affordability

AWG: Advisory Work Group

BACHI: Bay Area Clean Homes Initiative

BayREN: Bay Area Regional Energy Network

BARC: Bay Area Regional Collaborative

BARCAP: Bay Area Regional Climate Action Plan Initiative

BCD: Bay Conservation and Development Commission

BTM: Behind-the-meter

BUG: Backup generation

CAHPP: CA Heat Pump Partnership

CAL FIRE: California Department of Forestry and Fire Protection

CALGreen: California Green Building

CARB: California Air Resources Board

CBO: Community-based organization

CCAP: Comprehensive Climate Action Plan

CCA: Community Choice Aggregator

CCUS: Carbon capture, utilization, and storage

CEC: California Energy Commission

CH_4: Methane

CO: Carbon monoxide

CO_2: Carbon dioxide

CO_2e: Cabon dioxide equivalents

CPRG: Climate Pollution Reduction Grants

DC: Direct current

EE: Energy efficiency

EV: Electric vehicle

EVSE: Electric vehicle supply equipment

GHG: Greenhouse gas

GW: Gigawatt

GWh: Gigawatt hour

GWP: Global warming potential

HFCs: Hydrofluorocarbons

HPWH: Heat pump water heater

IPCC: Intergovernmental Panel on Climate Change

kW: Kilowatt

MSA: Metropolitan Statistical Area

MTC: Metropolitan Transportation Commission

MT C: Metric tons of carbon

$MTCO_2e$: Metric tons of carbon dioxide equivalent

$MMTCO_2e$: Million metric tons of carbon dioxide equivalent

MW: Megawatt

NEEA: Northwestern Energy Efficiency Alliance

NF_3: Nitrogen trifluoride

N_2O: Nitrous oxide

NO_x: Nitrogen oxides

NWL: Natural and working lands

PBA: Plan Bay Area

PCA: Priority Conservation Area

PCAP: Priority Climate Action Plan

PFCs: Perfluorocarbons

PG&E: Pacific Gas and Electric Company

PM: Particulate matter or secondary aerosols

RCDs: Resource Conservation Districts

SB: Senate Bill

SCTCA: Sonoma County Transportation and Climate Authorities

SF_6: Sulfur hexafluoride

SLCP: Short-Lived climate pollutant

SO_2: Sulfur dioxide

SPUR: San Francisco Bay Area Planning and Urban Research Association

TDM: Transportation demand management

TOC: Transit-Oriented Communities

UCCE: University of California Cooperative Extension

UEF: Uniform energy factor

US DOE: United States Department of Energy

US EPA: United States Environmental Protection Agency

VMT: Vehicle miles traveled

VOC: Volatile organic compound

WAIRE: Warehouse Actions and Investment to Reduce Emissions

WUI: Wildland-urban-interface

ZE: Zero-emission

ZEV: Zero-emission vehicles



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1 Introduction

Climate change is already happening in the San Francisco Bay Area (Bay Area) today, as evidenced by wildfires and smoke-filled skies, record-breaking heatwaves, major storms, flooding, and continually rising seas. Bold action to reduce climate pollution (or greenhouse gas (GHG) emissions) is critical to address the climate crisis and prevent its most devastating impacts – and bring key quality of life improvements and economic development benefits to the region.

The State of California and many local governments in the Bay Area have committed to ambitious GHG emission reduction goals. They have also adopted climate action plans that specify what must happen to meet them. Because nearly 80% of GHG emissions in the region come from the burning of fossil fuels, a core strategy is shifting from a fossil fuel-based economy to one that is based on clean energy. Solutions that work with nature (nature-based solutions) and keep waste to an absolute minimum (circularity) will be critical as well. Not only do these solutions reduce emissions, they also benefit the region by improving the health and quality of life for Bay Area residents, supporting healthy natural systems, and creating a more sustainable and prosperous economy. To ensure that all communities have equal access to these benefits, historically underserved communities must be centered in how these solutions are designed and implemented.

These climate goals and benefits will require everyone to play their part at the state, local, and regional levels. This is where the Bay Area Regional Climate Action Plan (BARCAP) comes in. Rather than duplicating the measures in state and local climate plans, it complements these plans with a focus on filling key gaps and enabling state and local plans to be successfully implemented. The BARCAP tackles common challenges that cross city and county boundaries and slow or impede local action, like misaligned policies, hard-to-get financing and funding, supply and workforce shortages, insufficient technical support, and unequal access to programs. Regional collaboration – on programs, outreach, development of policies and standards, data-sharing, acquiring funding/financing, and access to benefits – can help make local action easier, faster, cheaper, and more equitable. The BARCAP identifies where regional action is essential to

ensure that state plans and policies succeed in the Bay Area, and in ways that are equitable and bring tangible benefits to the region. It also encourages the expansion of promising local solutions across the region, bringing economies of scale and centering equity in deployment. Equity in this context refers to "increasing access to power, redistributing and providing additional resources, and eliminating barriers to opportunity, in order to empower low-income communities of color to thrive and reach full potential."[4] More information on how equity will be centered in BARCAP implementation is included in Chapter 12.

As the Bay Area's first regional climate action plan, the BARCAP lays out a set of feasible, actionable, and widely supported strategies to accelerate the region's transition to a clean energy economy and a carbon neutral future.[5] Implementation of the BARCAP will reduce GHG emissions, criteria air pollutants, and hazardous air pollutants; create jobs and spur economic growth; and enhance health and quality of life for Bay Area residents. The plan is designed to help ensure these benefits reach communities that have historically been marginalized, and frontline communities that bear the brunt of the impacts from fossil fuel dependence, including poor air quality, and are often the first to experience climate impacts such as extreme heat.



Vision for the BARCAP:

Together, we envision a Bay Area where achieving our climate goals fosters thriving communities, healthy natural systems, and a sustainable and prosperous economy. On the path to that future, we will create family-sustaining jobs, inspire innovation, improve air quality and public health, and prioritize environmental justice.[6]

The BARCAP is rooted in regional collaboration. While the Air District coordinated development of the plan, the Air District is only one of many implementers. Other agencies and organizations will lead the implementation of different parts of the plan, including in areas that extend beyond the Air District's jurisdiction.

Together, the Bay Area has a strong foundation to lead on climate action: supportive state policies and ambitious local plans and policies, world-class academic institutions, an innovative business community, diverse, knowledgeable and engaged residents, and a strong network of non-profits and community organizations. With a thoughtful approach, the region is well-positioned to tackle climate change in a way that improves health and quality of life for everyone, boosts the economy, and benefits frontline communities. The BARCAP is a crucial piece of this strategy.

1.1 THE NEED FOR CLIMATE ACTION NOW

Reliance on fossil fuels to power the region's economy, homes, and transportation results in GHG emissions that warm our atmosphere, alter our climate, and threaten the Bay Area's people, economy, environment, and infrastructure.

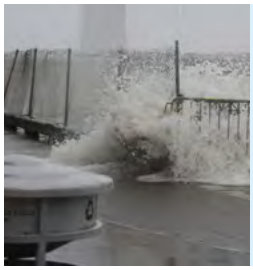
Over the past two decades, the Bay Area has seen increasingly frequent and severe climate-related challenges, including:



Extreme Heat: The Bay Area's average annual maximum temperature has risen 1.5˚F since 2001.[7] By mid-century, the mean annual temperature is projected to increase by 3.3˚F.[8] The Bay Area is experiencing more heatwaves as a result and the number of extreme heat days (90-100˚F) is projected to increase to 30-50 days by the end of the century.[9] Intensifying extreme heat and wildfires are impacting air quality and public health. Higher temperatures accelerate the formation of ground-level ozone, worsening air quality and respiratory health.[10] Extreme heat is now the leading cause of weather-related deaths in California, underscoring the growing risk to Bay Area communities.[11]



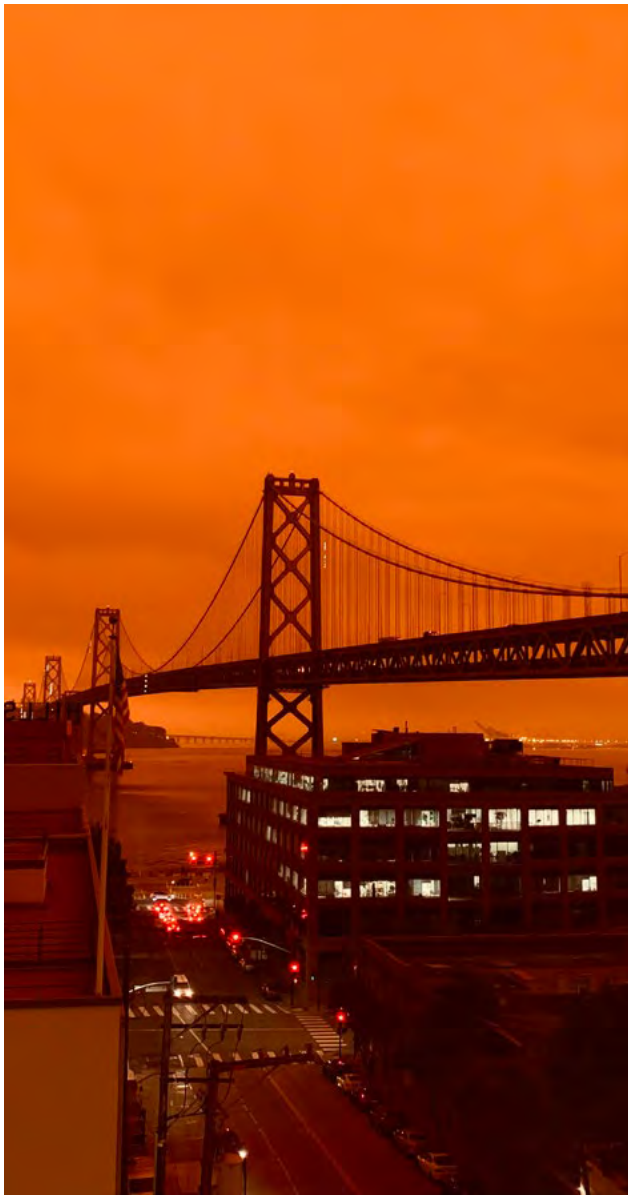
Wildfires: Drier, hotter conditions are conducive to wildfires, which further degrade air quality and increase health risks. Six out of the 15 most destructive wildfires in California history have occurred in the Bay Area, five of which have taken place in the last decade.[12] This destruction has immediate and lasting impacts. In 2018, 354,000 individuals were displaced in California due to wildfires.[13] Fire risk is projected to increase in the Bay Area as temperatures rise, particularly when paired with the potential expansion of the wildland-urban interface.[14]



Sea Level Rise: The Bay Area has seen an eight inch increase in sea level over the past century, with an additional 3.4 to 4.4 feet expected by 2100.[15] Future sea level rise threatens vital ecosystems, infrastructure, and frontline communities.[16] In combination with extreme storms, sea level rise also increases the risk of toxic chemicals leaking from hazardous sites.[17]



Drought and Extreme Precipitation: The Bay Area faces more frequent cycles of drought and extreme precipitation.[18] For example, the drought of 2012-2016 led to the greatest water deficits seen in 1,200 years. In contrast, during the winter of 2022–2023, California experienced a dozen atmospheric rivers, resulting in major flooding and landslides. Across the state, 43 out of 58 counties declared states of emergencies that winter.[19]



Climate-driven hazards such as extreme heat, wildfires, and declining air quality are increasing rates of respiratory and cardiovascular disease, hospitalizations, and premature deaths.[20] The economic consequences are also becoming apparent. In the past two decades, California was impacted by 31 weather and climate disasters with a billion dollars or more in damages. The two decades prior only experienced 14 events of the same caliber.[21] Here in the Bay Area, the San Francisco Bay Conservation and Development Commission (BCDC) estimates that, without adaptation, the cost of sea level rise could surpass $230 billion by 2050, accounting for property, infrastructure, and environmental losses from flooding and shoreline degradation.[22] Increased risks of natural disasters, including climate-related ones, translate to higher risks of property damage, with serious impacts on the homeowner insurance market.[23] State and local authorities are often first responders during a disaster and lead preparedness and long-term recovery efforts. As the cost and frequency of these events grows, greater portions of constrained public budgets may be diverted to these purposes, leaving fewer resources for other vital functions.

These impacts and the associated costs will not be experienced equally. Frontline communities are often disproportionately exposed to climate hazards due to historic discriminatory policies and practices such as redlining and disinvestment in infrastructure. As a result, these communities face higher health and economic risks today, with fewer resources to adapt to climate change.[24] Other groups such as people with disabilities or chronic conditions, people of color, Indigenous populations, older adults, children, pregnant people, low-income individuals, and people working outdoors or in hot environments are also at higher risk. These groups can experience differences in exposure, sensitivity, or ability to adapt to climate hazards, making them more vulnerable. For example, people with disabilities can face challenges responding to extreme weather events, especially if evacuation instructions and actions are inaccessible.[25]

1.2 THE BAY AREA CONTEXT

The Bay Area is well-positioned to lead boldly on climate action. In addition to the strong state, regional, and local climate plans and policies described throughout the BARCAP, the region can leverage its strengths to accelerate progress toward carbon neutrality while advancing equity and affordability. For the purposes of the BARCAP, the region includes eight counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Solano, and Sonoma (see Figure 1-1). It is referred to in this document as the BARCAP region. (Santa Clara County was funded by the U.S. Environmental Protection Agency (US EPA) to complete its own regional climate action plan.)

Figure 1-1: Map of the BARCAP region



1.2.1 Population

The greater Bay Area is one of the most diverse metropolitan areas in the United States.[26] Fifty-nine percent of the population are people of color, including many different racial and ethnic groups.[27] The Bay Area is home to speakers of more than 160 languages, nearly half (43%) of whom speak a language other than English at home.[28] The BARCAP region includes a population of approximately 5.5 million across eight counties and 81 cities that range from very small and rural, to large and dense. The region's diversity can support innovation by providing fresh perspectives and challenging conventional thinking. Bay Area residents understand that climate change is real and requires greater action. According to recent polling, over 70% of Bay Area residents are worried about climate change, and believe that governments, corporations, and citizens should do more to address the issue.[29] The BARCAP leverages this awareness and popular support for climate action while balancing climate goals with other goals of Bay Area residents, including affordability and economic security.

1.2.2 Community-based organizations

The Bay Area has a strong network of community-based organizations (CBOs) and an active climate youth movement dedicated to addressing existing inequities and improving the lives and well-being of the Bay Area's diverse communities. There are over 300 non-profits and CBOs supporting climate change mitigation in the Bay Area. Youth-led

climate action groups in the Bay Area are organizing and advocating for energy system reform, equitable decarbonization, and corporate accountability for pollution and GHG emissions.[30] Many Bay Area CBOs specifically serve non-English speaking and frontline communities, with an increasing focus on inclusion in the clean energy transition and protection from the effects of pollution and climate change. CBOs are experts in environmental justice and the lived experiences of community members and are, and will continue to be, key stakeholders for equitably implementing climate action. Their role in BARCAP implementation is further described in Chapter 12.

1.2.3 Economy

The BARCAP region's economy generated almost $869 billion in output in 2023.[31] Many leading-edge industries like aerospace and defense, biotech, clean tech, high-tech (e.g., hardware, software and services, semiconductors, and microelectronics), and manufacturing are based in the Bay Area.[32] The Bay Area is globally recognized as a center for climate technology. The BARCAP region is also home to many academic institutions and national research laboratories, an innovative business sector, engaged and knowledgeable residents, robust network of non-profits and CBOs, and strong environmental ethos. The Bay Area includes expansive natural and working lands as well, which support a large wine industry, dairy farms, tourism and outdoor recreation industries. The Bay Area Jobs First Collaborative Regional Plan identifies several areas for the region that present potential competitive advantages for



future job creation, including transportation electrification, battery storage and other renewable technologies, sustainable agriculture, and alternative fuel production.[33] The BARCAP region is home to refineries, power plants, and commercial ports too. While these industries play a key role in the regional economy, the emissions from their activities also have exacted a toll on the health of nearby residents, many of whom live near these facilities due to historic redlining. A history of venture capitalism and a robust network of philanthropic organizations complement the rich diversity of the region.[34]

The Bay Area's economy is also a polarized economy with a visible economic divide between high- and low-income earners and deep wealth inequality. Income inequality between low- and high-income earners has been growing rapidly over the past four decades.[35] Additional factors contributing to significant economic disparities include the cost of living, rising costs of housing, and lingering impacts on the job market from the COVID-19 pandemic.[36] In 2023, 31% of Bay Area residents spent over 35% of their income on housing, the threshold to be considered cost-burdened due to housing.[37] In conjunction with rising inflation and mortgage rates, homeownership and market rate rentals are becoming increasingly unattainable, particularly for low-income residents.[38] This inequality is compounded by the legacy of systemic and prolonged environmental injustice, disinvestment, and structural and institutional racism.[39] Today, the per capita median income of white Bay Area residents is two times greater than the median incomes of Hispanic/Latino, Indigenous, and Black residents.[40]

1.3 LOCAL AND REGIONAL CLIMATE ACTION



The BARCAP builds on the region's long history of leadership on climate action and a rich foundation of climate-related plans, programs, projects, and policies already in place.

1.3.1 Local action

Nearly every city and county in the BARCAP region (83 out of 88) has adopted a plan focusing on climate change, including climate action plans.[41] Roughly half of these jurisdictions have set targets for reducing GHG emissions that are at least as ambitious as the state's targets and many of them include equity as a key consideration. Other important local policies and programs

to reduce GHG emissions include building energy codes that exceed state mandated codes, general plans that address climate change, housing elements that aim to reduce vehicle miles traveled (VMT), and plans focused on transportation, urban forestry, and building decarbonization (i.e., transitioning gas appliances to clean electric alternatives paired with energy efficiency). In addition, six out of eight counties and over 30 cities in the BARCAP region have declared climate emergencies, making climate change a priority for immediate and accelerated action.

1.3.2 Regional action

Regional agencies are complementing local action through regional planning, programs, projects, and funding efforts for transportation, land use, buildings, energy, and more.

- The Metropolitan Transportation Commission and Association of Bay Area Governments (MTC-ABAG) develop and help implement Plan Bay Area 2050+, the Bay Area's long-range plan for transportation, housing, the economy, and the environment. This plan focuses on ensuring the Bay Area is affordable, connected, diverse, healthy, and vibrant for all by 2050.[42] Priorities include sufficient housing options for residents, a well-functioning multi-modal transportation system, clean air and water, conserving natural resources and open space, creating quality job opportunities for all, and providing ample fiscal resources for all communities.



- The Air District and MTC-ABAG provide incentives for clean transportation in the Bay Area. Examples include the Air District's Clean Cars for All program, which provides grants to offset the cost of new electric vehicles, and MTC's regional component of the Active Transportation Program, which provides funding to build bicycle and pedestrian infrastructure.[43]
- The Air District adopted amendments to existing rules to establish zero-NO_x emissions standards for natural gas-fired furnaces and water heaters that are typically found in residential and commercial buildings. These amendments will result in reduced air pollution, improvements in public health, and are expected to also reduce GHG emissions.
- The Bay Area Regional Energy Network (BayREN) at MTC-ABAG, a coalition of Bay Area counties working together, promotes resource efficiency at the regional level, through outreach, training, technical assistance, funding, and resources.
- Five Community Choice Aggregators (CCAs) purchase clean energy on behalf of residents and businesses and provide rebates and other incentives for clean vehicles and heat pumps.[44]
- Resource Conservation Districts (RCDs) work with landowners and communities to implement projects related to water conservation, soil health, and carbon farm planning. RCDs, working with the Carbon Cycle Institute and other collaborators, have organized into seven Regional Agriculture and Climate Hubs comprised of 45 California RCDs and spanning 12.5 million acres of agricultural lands, to better implement a Carbon Farming Network in the Bay Area and beyond.



1.4 CALIFORNIA'S CLIMATE ACTION FRAMEWORK

The State of California's climate action plan, the 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan), is comprised of a robust collection of statewide policies, programs, and sector-specific goals spanning every sector of the economy. The Scoping Plan provides a strategic policy roadmap to achieve statewide targets of reducing GHG emissions 40% below 1990 levels by 2030, and achieving carbon neutrality by 2045, with an 85% reduction in GHGs from 1990 levels. The Scoping Plan was shaped by extensive stakeholder engagement, including an Environmental Justice Advisory Committee. Since adoption, state agencies have implemented industry-leading regulations, initiated groundbreaking voluntary programs, and updated standing efforts to advance their goals, which are discussed in the sector-specific chapters (Chapters 6-10).

A core component of the state's climate action framework is its Cap-and-Invest program, which places declining GHG emissions caps on large-emitting facilities. In 2025, the Cap-and-Invest program was reauthorized and extended to 2045. Current state law prohibits local air districts from regulating carbon dioxide (CO_2) emissions – the most prevalent GHG emitted when fossil fuels are combusted – from facilities that are included in the Cap-and-Invest program. In the BARCAP region, these facilities account for most of the CO_2 emissions from the industrial sector, leaving the Air District with a very limited ability to directly address industrial GHG emissions. The BARCAP does not, therefore, include measures addressing the industrial sector. However, the Air District is exploring ways to maximize the GHG reduction co-benefits of its regulations that focus on other (non-CO_2) GHGs.





Embedding equity

Frontline communities, which may include communities of color, lower-income neighborhoods, and other historically marginalized groups and communities, tend to contribute the least to climate change yet often face disproportionate exposure to negative climate impacts and greater susceptibility due to underlying social and health inequities. These disparities are often due longstanding structural inequities such as red-lining and housing discrimination, occupational segregation, and lack of access to the funding and financing required to adapt. New climate solutions should prioritize building the resilience of and bringing benefits to these communities.

Frontline and historically marginalized groups, though, face persistent barriers due to long-standing systemic inequities. Housing instability, food insecurity, limited mobility access, and lack of time or money, can significantly limit people's ability to participate in voluntary climate programs or comply with mandatory requirements. If these obstacles are not addressed, climate actions will be less effective, as the people who are most affected by climate change will be the least able to take part in the solutions and benefit from them. Building the capacity of communities to fully participate in and benefit from local and regional actions to reduce GHG emissions should be central to new climate solutions. Embedding equity in climate action is a critical opportunity to invest in, and build resilience in frontline communities, while pushing for tangible improvements in everyday lives through deployment of climate solutions.

If not designed equitably, GHG reduction measures could exacerbate unfair or unequal outcomes and environmental injustices. For example, inequitable building electrification can leave people on legacy fossil fuel infrastructure that becomes increasingly expensive to maintain, worsen housing insecurity, and cause displacement. The BARCAP region risks repeating historical patterns of disinvestment and perpetuating past environmental injustices unless equitable and just approaches are incorporated when developing GHG reduction measures.

Environmental justice is defined by the pioneering environmental justice scholar Dr. Bunyan Bryant as: "Environmental Justice … refers to those cultural norms and values, rules, regulations, behaviors, policies, and decisions [that] support sustainable communities where people can interact with confidence that the environment is safe, nurturing, and productive. Environmental justice is served when people can realize their highest potential … where both cultural and biological diversity are respected and highly revered and where distributive justice prevails." Equitable climate action that advances environmental justice means no community is treated as "other" or expendable. This starts by valuing and prioritizing the lived experiences and leadership of historically marginalized communities. Centering equity and environmental justice involves approaching conversations with humility and sustaining community dialogue throughout implementation to inform actions — not just during the planning stage.

Equity and environmental justice were designed into the BARCAP through community vetted design principles, inclusion of frontline community feedback in draft measures, and working partnerships with CBOs.[45] Environmental justice values like biological diversity, sustainable communities, and safe environments can be found woven throughout BARCAP measures and actions as measure language. Measure benefits paint a fuller picture of how climate actions can improve frontline community lives beyond purely GHG reductions. As the BARCAP moves into the implementation stage, equity and environmental justice will continue to be centered.

For more information on equity in BARCAP implementation, see Chapter 12. For more information on the BARCAP's approach to engaging frontline communities, see Chapter 4 and Appendix E, as well as the Air District's commitment to center environmental justice as described in the 2024-2029 Strategic Plan.[46]



1.5 APPROACH TO DEVELOPING THE BARCAP

1.5.1 Overview of Climate Pollution Reduction Grant Program

In July 2023, the Air District received funding from the U.S. Environmental Protection Agency's (US EPA) Climate Pollution Reduction Grant (CPRG) Program. The CPRG Program provides funding to states, local governments, tribes, and territories to develop and implement ambitious plans for reducing GHG emissions and other harmful air pollutants. This funding enabled the Air District to launch the Bay Area's first region-wide climate action planning effort, resulting in two plans required by the US EPA.

The first plan is the Priority Climate Action Plan (PCAP).[47] It includes two near-term, high-priority, implementation-ready measures to reduce GHG emissions from residential buildings and passenger vehicles, which together make up one-quarter of the Bay Area region's GHG emissions. The PCAP was submitted to US EPA February 29, 2024. The second plan is this comprehensive BARCAP covering all sectors, which will be submitted to US EPA by December 1, 2025.[48]

1.5.2 BARCAP goals

The BARCAP focuses on four core goals:



Given the robust climate leadership in the Bay Area and the state's climate action framework, the BARCAP focuses on regional action and collaboration that addresses the space in between, helping advance local action and ensuring state plans and goals are more achievable and equitable in the BARCAP region. It does not seek to duplicate

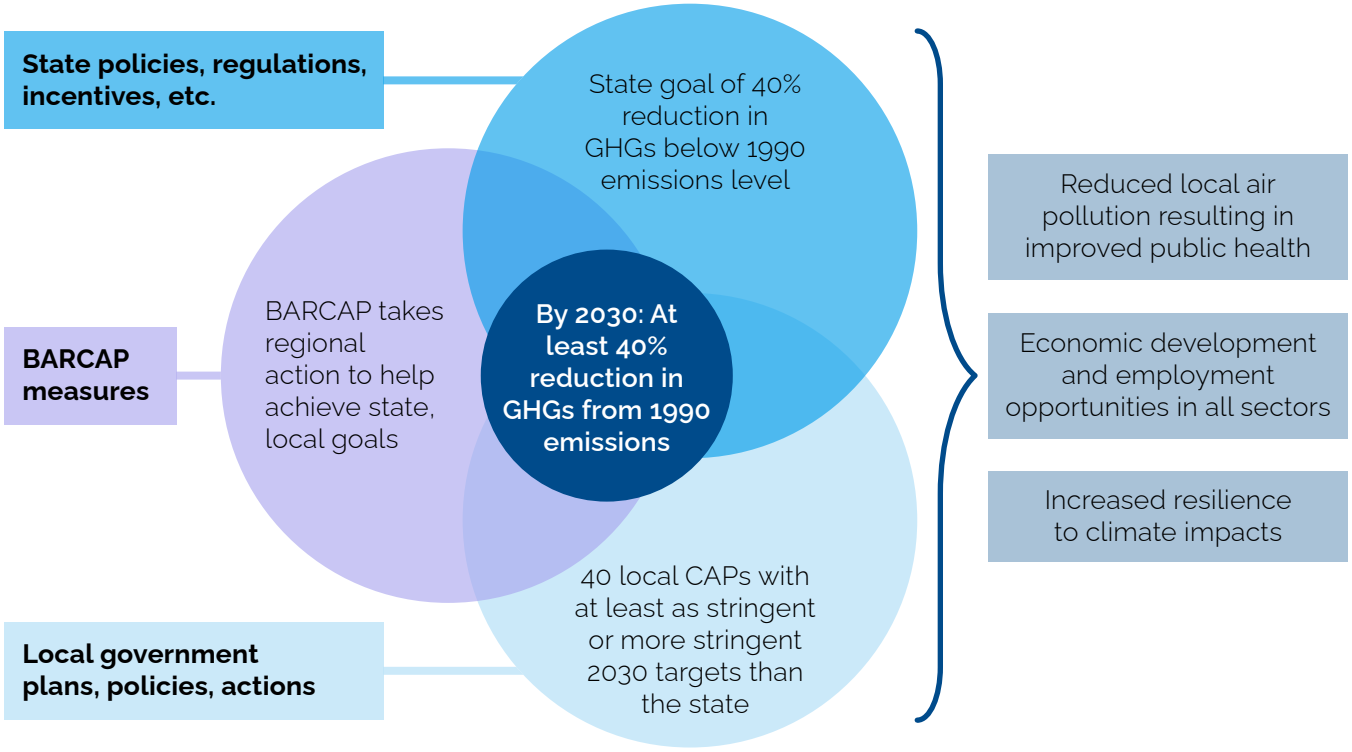
work already being done but rather focuses on filling gaps and tackling key challenges and obstacles to local action that only regional action can effectively address. It provides a vehicle to identify and encourage wider adoption of promising local climate solutions across the Bay Area. The BARCAP approach elevates and centers the priorities of frontline communities, building on the extensive work that cities and counties in the region have been doing for years.

While the Air District is coordinating development of the BARCAP, it is not the only implementer. Many sectors extend beyond the Air District's jurisdiction and expertise. Other agencies and organizations are well-suited and well-positioned to lead implementation in these areas. The general roles in implementation played by lead and supporting agencies and organizations are defined in Chapter 5. Specific lead and supporting implementing agencies and organizations are described in the sector-specific chapters (Chapters 6-10).

1.5.3 Supporting successful state and local climate action

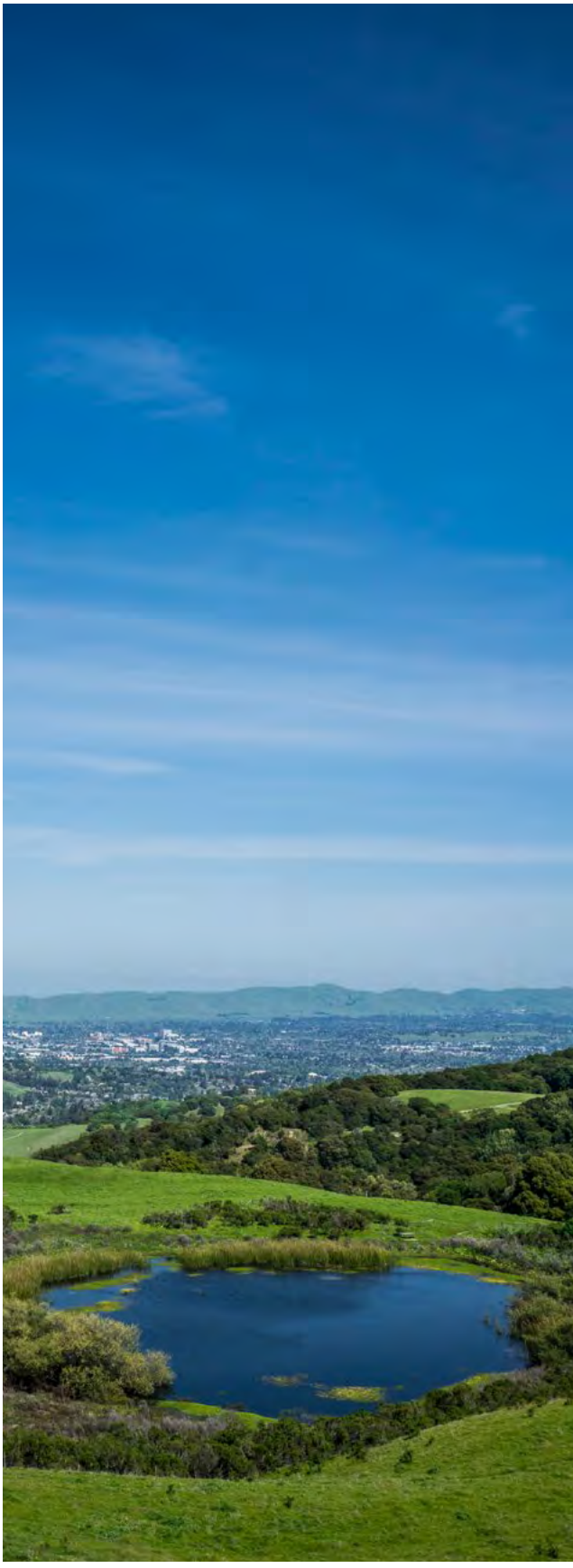
The BARCAP focuses on setting up key enabling conditions necessary to ensure that the GHG emission reductions outlined in state and local climate action plans are achieved – in full and on time. BARCAP measures are additive and not duplicative of state and local actions.

Figure 1-2: BARCAP measures contributing to local and state goals



Many Scoping Plan measures rely on local and regional action to fully realize their GHG reduction potential. For example, Senate Bill 1383 (2016) requires reducing the amount of organic waste disposed in landfills by 75% below 2014 levels by 2025. While the state has set this target, it cannot be achieved without alternatives for managing organic waste, local waste diversion, and education programs. Similarly, the Scoping Plan includes the statewide goal of 100 percent of in-state sales of new passenger cars and trucks being zero-emission by 2035. This goal cannot be met without a robust regional electric vehicle (EV) charging network and local policies that enable a rich local charging infrastructure. Without sufficient local and regional action, the state is unlikely to meet its climate goals.

Local governments often face common challenges that can slow or impede local climate action. These barriers include misaligned policies, hard-to-get financing and funding, supply and workforce shortages, insufficient technical support, and unequal access to programs. The BARCAP focuses on where regional collaboration – on programs, outreach, development of policies and standards, data-sharing, acquiring funding/financing, and access to benefits – can help make local action more efficient, effective, and equitable. Increased regional coordination also enables the scaling of promising local solutions.



1.5.4 Overview of BARCAP development

Foundational research

From May 2024 to November 2025, the Air District partnered with regional agencies, local governments, and other stakeholders across the region to develop the BARCAP. The thoughtful and phased approach began with an assessment of existing local climate action plans and the Scoping Plan, as well as key state and regional policies and programs. Air District staff also reviewed other state and regional PCAPs for innovative and impactful measure concepts to consider for inclusion in the BARCAP.



Stakeholder engagement

Building on the foundational research, the Air District engaged local governments to learn about specific challenges and barriers to local climate action that could be addressed through a regional approach, and opportunities to advance local climate action that cross jurisdictional borders. Local governments also provided feedback through a virtual input session on preliminary measures, specifically on alignment with city and county efforts, potential interest in implementation, and other critical concerns and opportunities.

The Air District partnered with eight local CBOs to hold a series of four workshops with frontline communities. Through these workshops, members of frontline communities shared community priorities and how the preliminary BARCAP measures might benefit or negatively impact their everyday life. The public was invited to provide feedback on the BARCAP vision, initial measure concepts, and final proposed measures through a series of three public workshops. There was also a public survey that resulted in 680 responses. Information about these engagement opportunities was shared through a dedicated BARCAP website and email list, the Air District's social media channels, and local government communication channels.

The Air District established an Advisory Work Group (AWG) composed of representatives from each county, the City of Oakland, regional agencies, and community-serving and community-based organizations. It served as a key forum for regional coordination and collaboration to support the Air District's development of the BARCAP. Members helped identify key gaps, challenges, and opportunities for the plan to address, and helped connect the BARCAP with local governments and communities in their jurisdictions. They also reviewed key BARCAP deliverables.

Measure development

The Air District developed a GHG inventory and projections to understand the main drivers of current and future GHG emissions in the BARCAP region. The agency also identified a set of core criteria and design principles to guide measure development. Combining GHG emissions data, foundational research, and initial stakeholder input, the Air District worked with sector-specific technical working groups composed of potential implementers, community organizations, and subject matter experts to develop measure concepts, which were further refined with a technical consultant. The Air District also met with regional agencies and potential implementers to finalize draft measures prior to a four-week public review period. The final measures reflect public feedback and the results of several technical analyses, including a frontline communities impacts analysis, workforce planning analysis, and a funding analysis.

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2 Regional Greenhouse Gas Inventory and Projections and Carbon Stock Inventory

The regional greenhouse gas (GHG) emissions inventory and projections detail the major GHG emission sources in the Bay Area Regional Climate Action Plan (BARCAP) region while the carbon stock inventory shows where carbon is stored in both plants and soils (i.e., carbon stocks) on natural and working lands. These inventories and the projections were used to inform the BARCAP measure development.

2.1 GHG INVENTORY

2.1.1 Overview

The GHG emissions inventory provides emissions data for the base year of 2022.[1] It accounts for county-level emissions from the BARCAP region across six major sectors – transportation, industrial, buildings, power, waste, and agriculture (as part of natural and working lands).[2] Specific emissions sources within each sector are defined and discussed in Appendix A. The natural and working lands carbon stock inventory is discussed in Section 2.3.

For all sources, the following GHG emissions are quantified: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and several fluorinated gases, including hydrofluorocarbons (HFCs),

perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). GHG emissions are reported in terms of CO_2-equivalents (CO_2e), which is a standardized metric to compare emissions across different GHGs. This metric is calculated using 100-year time-horizon global warming potentials (GWP). GWP is a measure of how much heat a specific GHG traps in the atmosphere relative to the same amount of CO_2. The 100-year time horizon represents how much a given GHG will contribute to global warming over a 100-year time frame. Some GHGs, like CH_4, N_2O, and particularly fluorinated gases, have high GWPs and thus make greater contributions to global warming on a per ton basis than CO_2. The BARCAP inventory uses GWPs from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5).[3]

2.1.2 Inventory methodology

The Air District applied a production-based methodology to develop the GHG emissions inventory. This approach focuses on the emissions released directly into the atmosphere from sources located within the BARCAP region. This differs from a consumption-based methodology, which attributes emissions to regional consumers by accounting for the full life-cycle emissions of goods and services consumed locally, regardless of where those emissions occur globally. For example, emissions from electricity generated from power plants in the BARCAP region are included in the inventory, whereas emissions from electricity consumed in the BARCAP region but generated beyond the BARCAP region's borders are excluded.



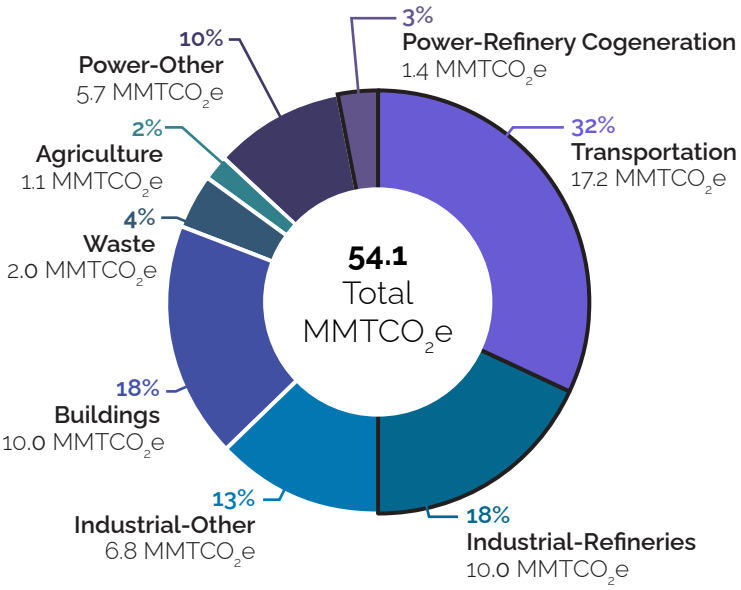
Within the production-based methodology, the Air District uses two approaches to estimate GHG emissions, depending on the type of emissions source:

- A bottom-up approach where emissions are derived by combining activity data and/or throughputs with GHG emissions factors and local or regional controls;[4]
- A top-down approach where emissions are derived by scaling down from an existing (e.g., national and/or state) emissions inventory using a proxy (such as population, vehicle miles traveled, etc.).

More details on inventory accounting methods can be found in Appendix A.

2.1.3 GHG inventory key results

Figure 2-1: GHG emissions for the different sectors, in $MMTCO_2e$ and in percent relative to the total of 54.1 $MMTCO_2e$. Emissions related to transportation are outlined in black.



The annual GHG emissions for the Bay Area region for the year 2022 total 54.1 million metric tons of CO_2e ($MMTCO_2e$), as shown in Figure 2-1 (subsector detail in Table 3-2 and Figure 3-1 in Appendix A). For context, this total represents about 15% of California's statewide GHG emissions in 2022.[5] Transportation (32%) is the largest contributing sector to the annual total GHG emissions, followed by industrial (31%) emissions. Other high contribution sectors include buildings (18%) and power (13%).

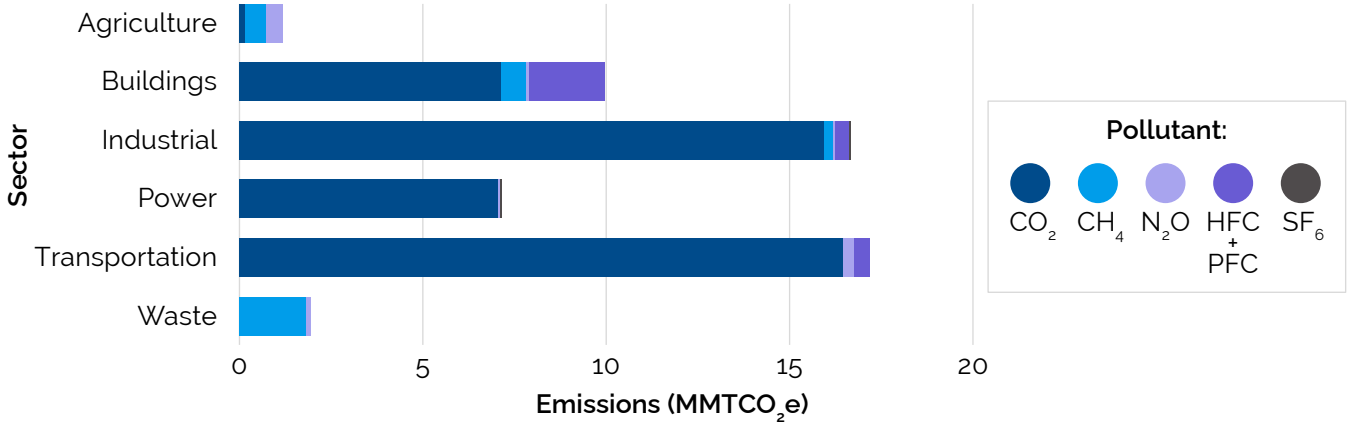
As currently defined for the BARCAP, the transportation sector only accounts for GHG emissions from the combustion (end-use) of fossil fuels to move people and goods (e.g., tailpipe emissions from on-road motor vehicles, fuel combustion exhaust from ships and airplanes, etc.). However, every lifecycle stage of fossil fuel extraction, processing, and use for the transportation sector generates GHG emissions. While the BARCAP region has negligible fossil fuel extraction sources, processing of fossil fuels for the transportation sector at the BARCAP region's refineries contributes significantly to the industrial sector emissions, accounting for over 60% (~10 $MMTCO_2e$) of that sector's total GHG emissions. In addition, on-site cogeneration of electricity for use at these refineries, categorized under the power sector, adds another 1.4 $MMTCO_2e$ or 20% to that sector's total. When combined with the transportation sector emissions, the GHG emissions related to transportation that are associated with both production (extraction and processing) and consumption (combustion) of fossil fuels account for over half of the total regional GHG emissions in 2022 (53% or 28.6 $MMTCO_2e$), as seen by the sectors outlined in black in Figure 2-1.

2.1.3.1 By GHG pollutant

CO_2 is the predominant GHG pollutant, representing 86% of the GHG emissions in the BARCAP region, mostly from combustion of fuels across the transportation, buildings, power, and industrial sectors. About half of CH_4 emissions, which constitute >6% of the BARCAP GHG inventory, are emitted from landfills in the waste sector; however, recent measurement studies have indicated that current inventory approaches may be

underestimating landfill methane emissions (see Appendix A Chapter 4 – Uncertainties and Future Improvements). About 44% of all N_2O emissions in the BARCAP region can be attributed to the agriculture sector, mostly due to fertilizer use. Nearly 6% of regional GHG emissions are attributed to leakages and fugitive losses of fluorinated high-GWP gases (including HFCs, PFCs, CFCs, HCFCs, and SF_6), a majority of which occur in the building sector as refrigerants.[6] The distribution of the different climate pollutants by sector in the BARCAP region is shown in Figure 2-2.

Figure 2-2: Pollutant contributions by sector to the greenhouse gas emissions inventory for 2022



2.1.3.2 *By county*

Figure 2-3: Relative percentages of GHG emissions from each county in the BARCAP region

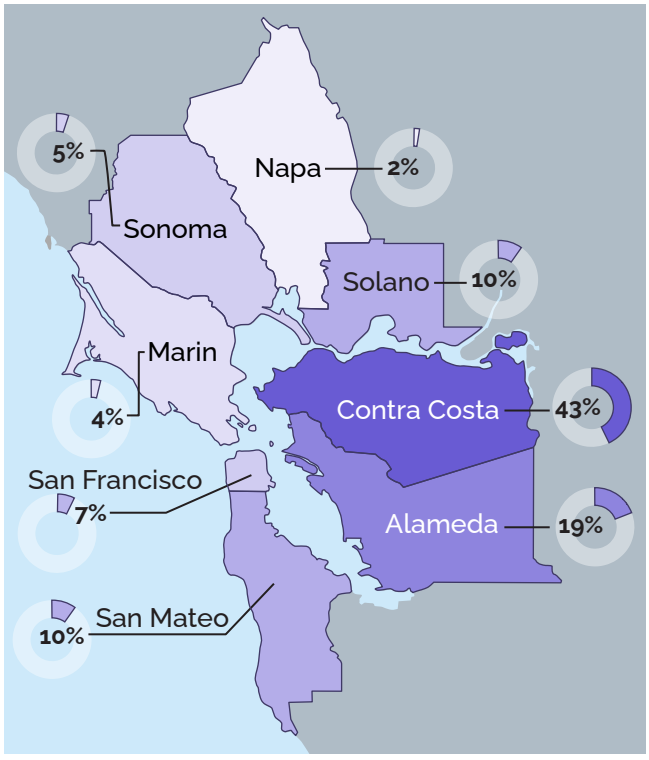


Figure 2-3 shows the distribution of emissions by county across the BARCAP region in 2022. Contra Costa County stands out as the county with the most GHG emissions (~45%). This is, in large part, because the county is home to four refineries and the majority of the power plants in the BARCAP region. The fifth refinery is in Solano County, which otherwise has relatively low GHG emissions, due to only the southern part of the county being included in the BARCAP region. In the other six counties, the transportation sector and buildings sector account for the majority of GHG emissions. A detailed breakdown is provided in Table 3-2 in Appendix A, showing emissions by county and sector.

2.2 GHG INVENTORY HISTORICAL EMISSIONS AND FUTURE PROJECTIONS



2.2.1 Overview

Historical emissions (back-cast to 1990) and future emissions projections (projected forward to 2050) provide insight into past emission trends and expected future trends. The historical back-cast uses the most recent available data to analyze emissions over the past 35 years. This information helps identify major emission sources and evaluate progress over time.[7] Future emissions projections extend through 2050 and are largely based on the California Air Resources Board's 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan) reference scenario and incorporate anticipated population growth and economic development for the BARCAP region. Additionally, the Air District's regulations for residential appliances (Rules 9-4 and 9-6) are incorporated into the future projections.[8] Together, the historical back-cast and the future projections provide a foundation for prioritizing measures and understanding the effectiveness of implemented measures over time.

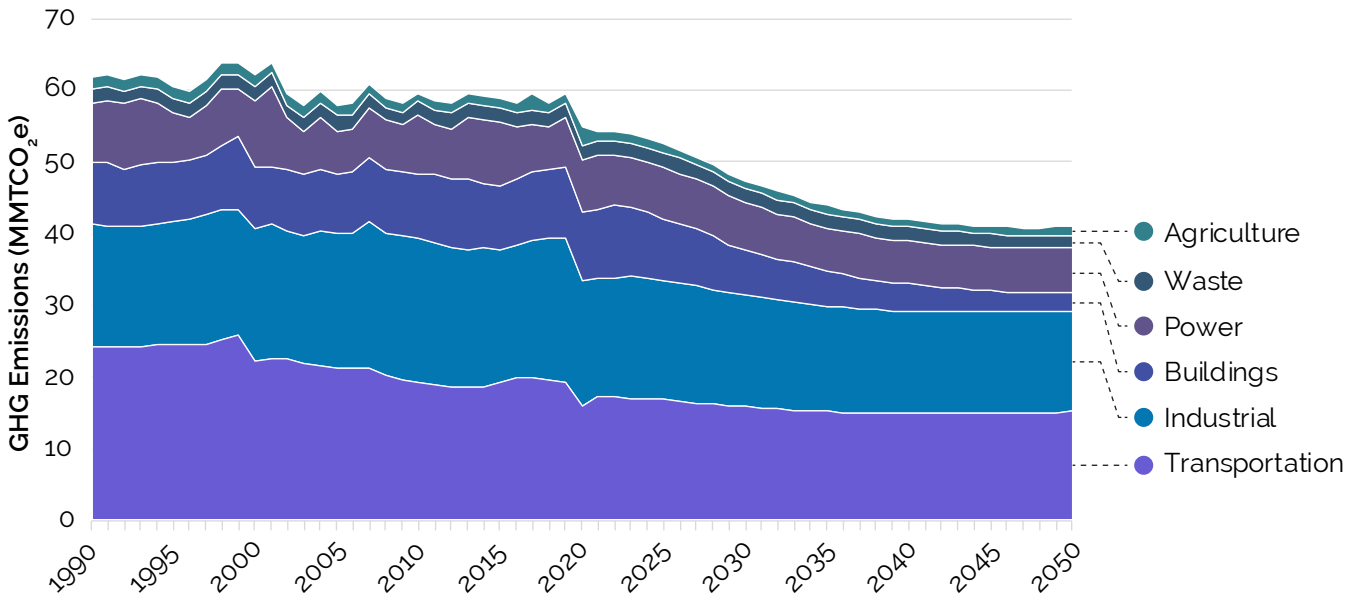
2.2.2 Historical emissions and future projections key results

The BARCAP region's total GHG emissions have dropped from 62.2 $MMTCO_2e$ in 2000 to 54.1 $MMTCO_2e$ in 2022, representing a 13% decrease, primarily resulting from reduction in emissions in the transportation (-23%) and power (-23%) sectors, as shown in Figure 2-4. For the transportation sector overall, on-road mobile source GHG emissions have declined significantly over the past few decades despite a growing vehicle population

and long-term increase in vehicle miles travelled (VMT) in the BARCAP region. This is largely due to reduced fossil fuel use from improved fuel economy and increased use of electric vehicles. In the power sector, the decline in GHG emissions is largely driven by the growing proliferation of renewable energy, which has reduced the BARCAP region's reliance on natural gas for power production. This trend is further strengthened by an increase in residents opting to purchase cleaner and renewable energy through public Community Choice Aggregators.[9] Over the past two decades, declining natural gas use in electricity generation has been offset by increased demand for natural gas use for space- and water-heating in the buildings sector, driven by the region's economic growth and rising population.

Annual GHG emissions for 2050 (which does not include emission reductions expected from the measures included in the BARCAP) are projected to decline to 36.7 $MMTCO_2e$ in the BARCAP region across major sectors including transportation (-12%), industrial (-16%), and power (15%). This anticipated trend reflects the impact from California's efforts to reduce fossil fuel use through promoting zero-GHG transportation, the state's Cap-and-Invest program that disincentivizes and puts a cap on GHG emissions from large emitters (power plants, landfills, etc.), and the continuing decarbonization of the Bay Area's electric power generation mix as required under the Renewables Portfolio Standard.[10] In comparison, annual GHG emissions of the buildings sector are expected to decline by 73% by 2050, with 70% primarily resulting from the Air District's Rule 9-4 and Rule 9-6, which require newly installed furnaces and water heaters to meet a zero-NO_x standard. While Rules 9-4 and 9-6 do not require the use of electric appliances, currently only electric appliances will meet the zero-NO_x standard.[11] Figure 2-4 shows the change in GHG emissions for each sector over time. More information on historical emissions and future projections can be found in Appendix A.

Figure 2-4: Changes in GHG emissions (in $MMTCO_2e$) by sector over time[12].



2.3 CARBON STOCK INVENTORY



2.3.1 Overview

The Air District developed a carbon stock inventory for the BARCAP region for the year 2022. This inventory illustrates where carbon is stored across the landscape in both plants and soils (i.e., carbon stocks). It can be used to understand the overall importance of natural and working lands for climate action, quantify and locate carbon at risk of being lost due to wildfire or development, and understand the impact of natural and working lands climate measures described in Chapter 10.

The carbon stock inventory does not include historical carbon stock amounts or project future carbon stock amounts. CARB is currently updating its Natural and Working Lands Carbon Inventory, which will include detailed data for the BARCAP region for carbon stock amounts.[13] This updated analysis may also lead to changes in statewide future carbon stock projections. The Scoping Plan shows that despite the vast amounts of carbon stored across lands in the state, natural and working lands are projected to be a source, not a sink, of carbon into the mid-century due to estimated carbon losses mainly from drought and wildfire.[14] These statewide projections are expected to hold true for the Bay Area.

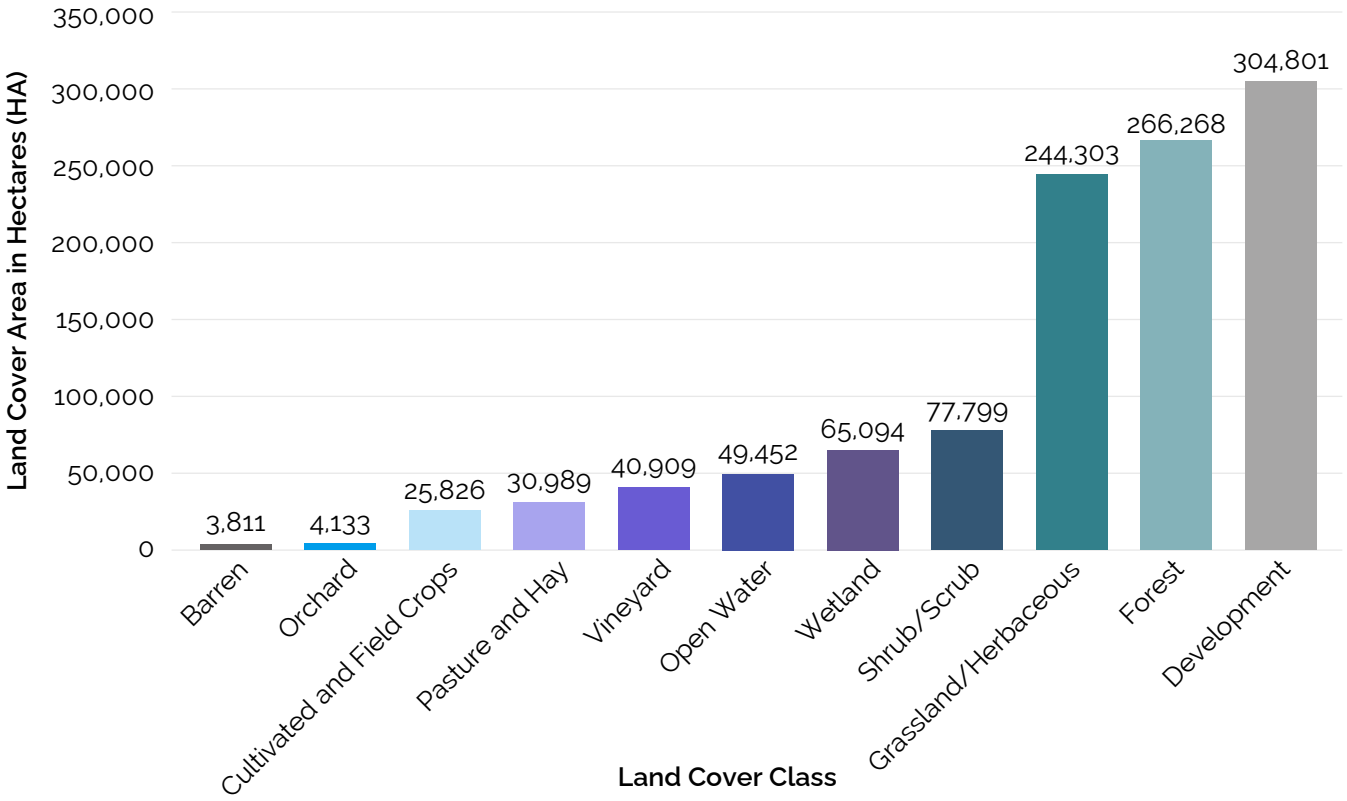
2.3.2 Carbon stock inventory methodology

The BARCAP region carbon stock inventory aligns with the most recent 2018 statewide carbon stock inventory described in the Scoping Plan, as well as local analyses conducted in Sonoma and Contra Costa counties. Santa Clara County conducted its own parallel and aligned carbon stock inventory for its own U.S. Environmental Protection Agency (US EPA)-funded Climate Pollution Reduction Grant (CPRG) effort. For a more comprehensive description of the carbon stock methodology and regional and state alignment, refer to Appendix B.

2.3.3 Carbon stock inventory key results

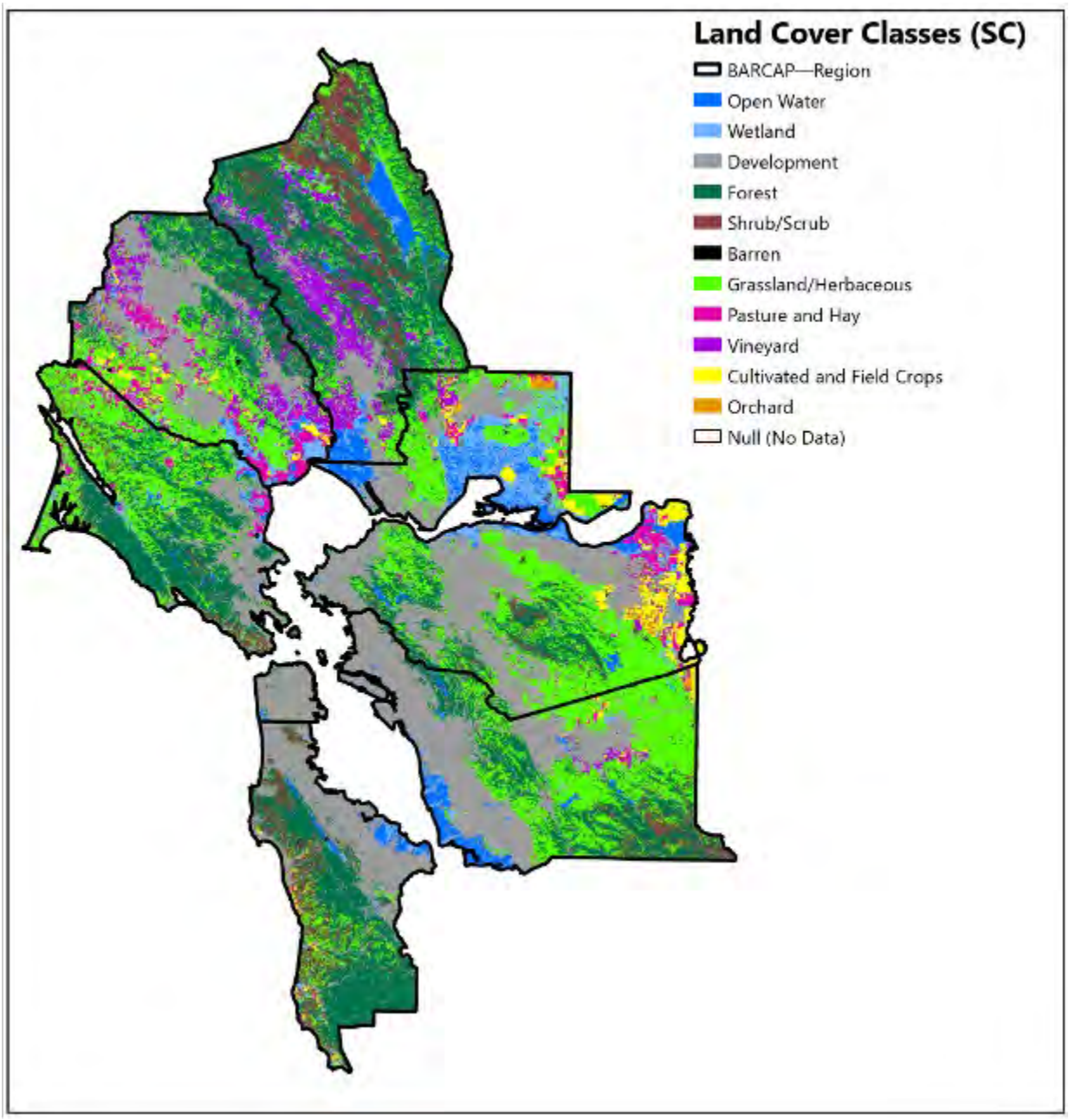
In order to quantify carbon stocks held in plants and soils across the eight counties, landcover types across the BARCAP region must first be mapped. As shown by the maps and figures below, the eight-county BARCAP region is mainly comprised of developed urban, forested, and grassland/herbaceous lands. Developed urban and suburban lands cover the largest area across the BARCAP region, taking up 27% of total hectares. Forested lands are the second largest category, covering 24%, followed by grassland/herbaceous lands at 21% of total hectares. All other landcover types are less than 10% of the total as shown in Figure 2-5, which displays all mapped landcover types from lowest to highest proportion, with total hectares identified. As carbon held in plants and soils is calculated in part based on landcover type, it is important to first identify prevalence of different kinds of landcovers across the BARCAP region.

Figure 2-5: BARCAP region total land cover in hectares



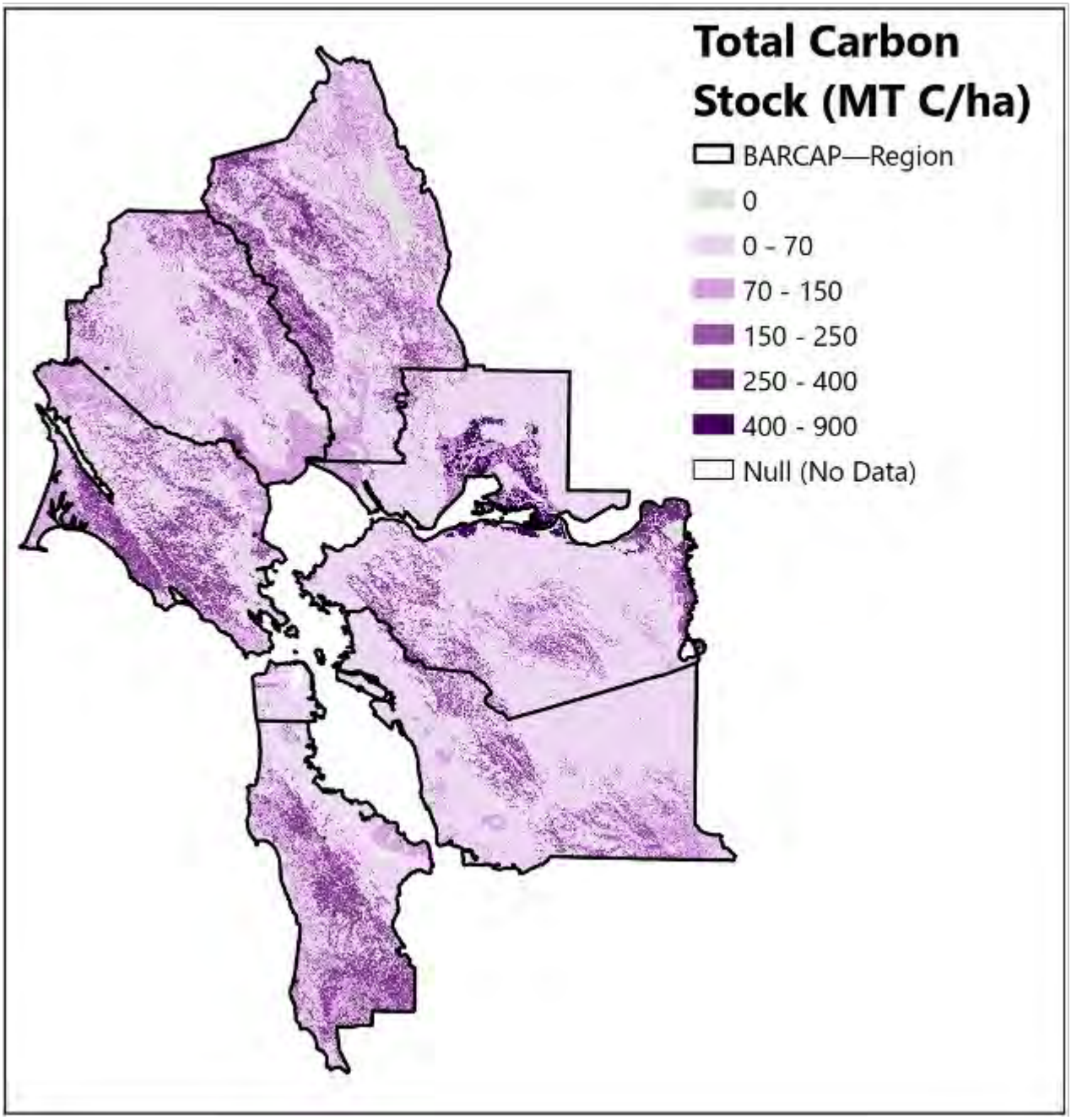
The geographic distribution of these landcover types is illustrated across the region in Figure 2-6. Highlights from the mapped landcover types include high densities of forests in Napa, Marin, and San Mateo counties, dominance of wetlands in mapped portions of Solano County, and high proportions of developed lands in Contra Costa, Alameda, and San Francisco counties.

Figure 2-6: Land cover types across the BARCAP region



Plants and soils across the region held 92,335,131 metric tons of carbon (MT C), as shown in Figure 2-7. These carbon stocks are six times larger than total GHG emissions across the BARCAP region for 2022, underscoring the importance of natural and working lands for Bay Area climate action.[15] While the BARCAP GHG Inventory uses units of MT CO_2e, MT C is used to describe carbon held in plants and soils to be consistent with the State and Intergovernmental Panel on Climate Change (IPCC) standards.[16]

Figure 2-7: Total carbon stock per hectare (metric tons carbon/hectare)



Forests and wetlands hold the highest density of carbon across Bay Area lands. Forests on average store 175 MT C per hectare, while wetlands store 133 MT C per hectare - both are significantly higher than the average of all land cover classes of 83 MT C per hectare, as shown in Table 2-1.

Table 2-1: 2022 Total Carbon Stock by Landcover Type

LAND COVER CLASS	AREA IN HECTARES	TOTAL CARBON STOCK IN MT C	AVG. TOTAL CARBON STOCK IN MT C PER HECTARE
Barren	3,811	139,387	37
Orchard	4,133	377,494	91
Vineyard	40,909	1,673,057	41
Cultivated and Field Crops	25,826	2,397,443	93
Pasture and Hay	30,989	2,570,126	83
Open Water	49,452	3,668,746	74
Shrub/Scrub	77,799	5,270,461	68
Wetland	65,094	8,632,855	133
Grassland/Herbaceous	244,303	10,296,937	42
Development	304,801	10,652,489	35
Forest	266,268	46,656,135	175
Total	***1,113,384***	***92,335,131***	***83***

Total ecosystem carbon stocks are nearly equally split between carbon held in plants (biomass) and carbon held in soils.[17] Carbon in soils comprises 51% (47,455,018 MT C, or 174,001,733 MT CO_2e) of total ecosystem carbon, while carbon in plants comprises 49% (44,880,113 MT C, or 164,560,414 MT CO_2e).[18] These soil and plants carbon values have been converted to units of CO_2e in order to emphasize their importance for regional climate action, and compare to total GHG emissions: carbon in soils is over 3.2 times larger than total regional emissions (54.1 MMT CO_2e), while carbon in plants is ~3 times larger than total regional emissions (see Figure 2-8). This distribution is shown on the following pages in Figure 2-9 and Figure 2-10, with separate visualizations for carbon held in soils (Figure 2-9), and carbon held in plants (Figure 2-10).

Figure 2-8: Comparison of soil and plant carbon values to total regional emissions (CO_2e)

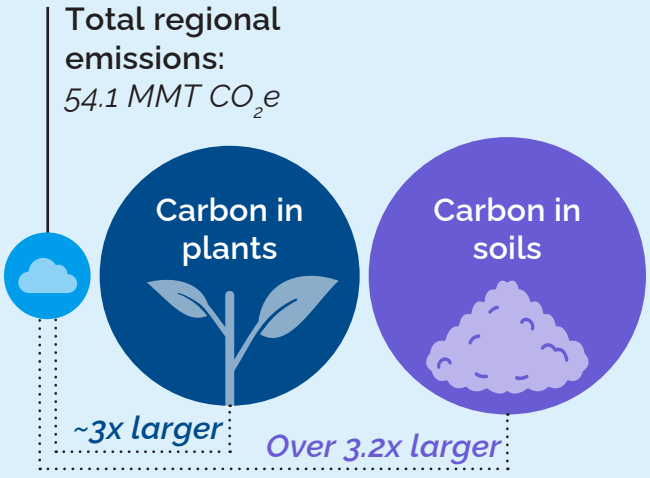


Figure 2-9: Soil carbon stock per hectare (metric tons carbon/hectare)

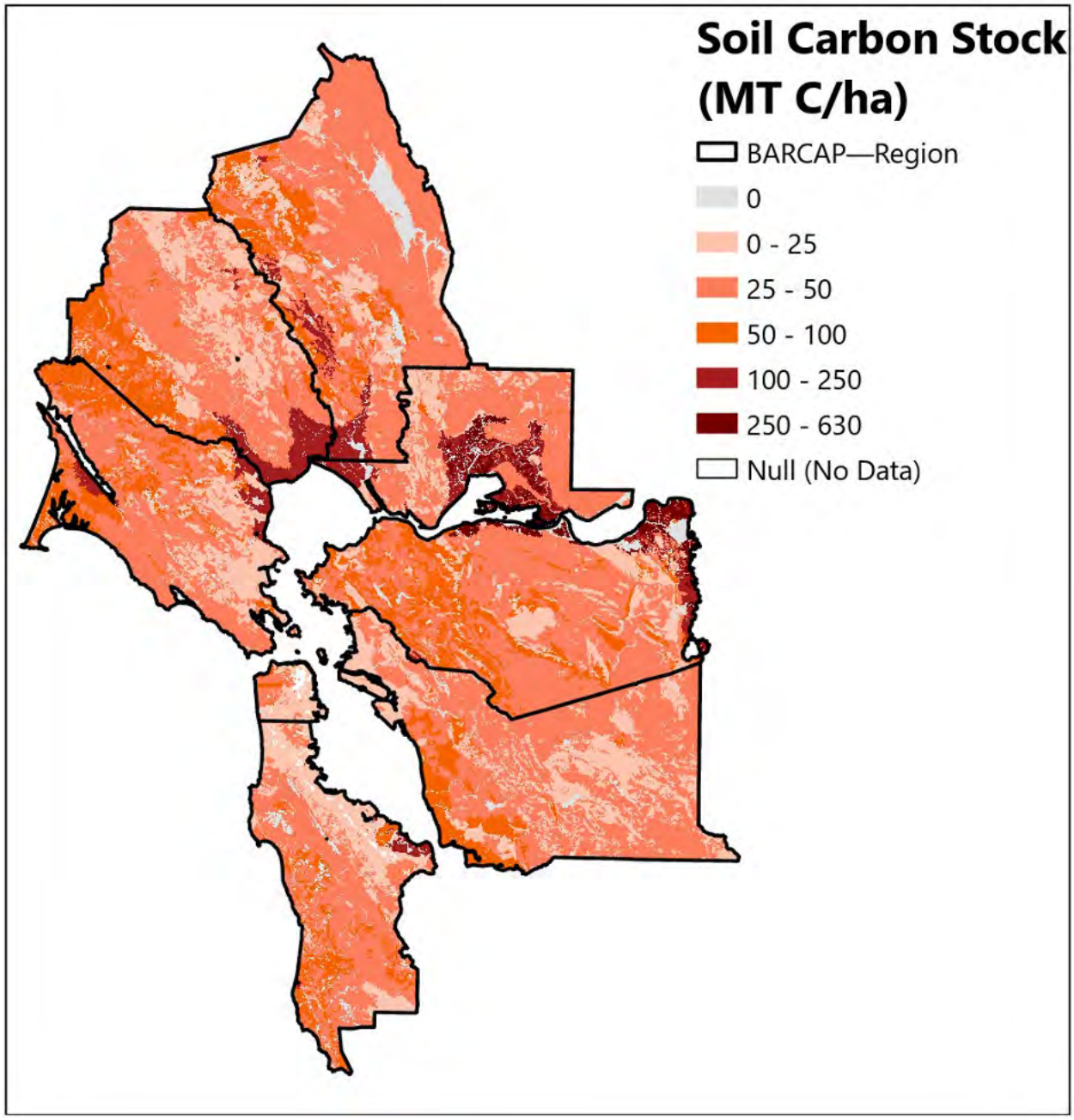
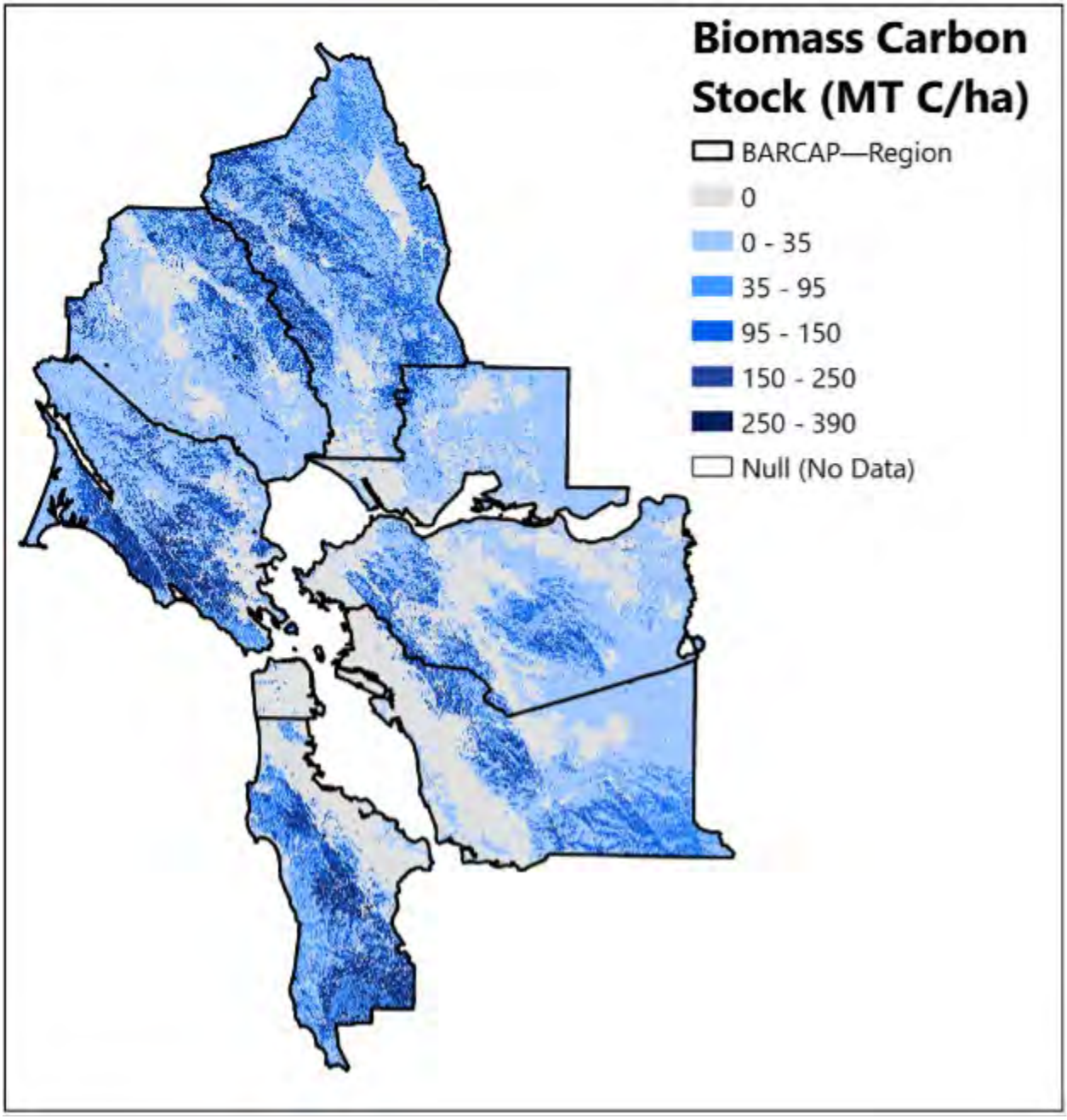


Figure 2-10: Plant (biomass) carbon stock per hectare (metric tons carbon/hectare)



Wetlands are notable for the density of carbon held in their soils. Despite comprising only 6% of total landcover, wetlands account for 14% of total soil carbon stocks across the BARCAP region. However, developed lands, forests, and grassland/herbaceous lands are the three largest total pools of carbon held in soils due to a combination of their soil carbon density (i.e., in forests and grasslands), and/or sheer area across the BARCAP region.

Forests are the most significant pool of carbon held in plants, accounting for 82% of the total plant carbon pool, with significant density of forest landcover types in Napa, San Mateo, Sonoma, and Alameda Counties. Scrub and shrub lands account for the second largest pool of carbon held in plants, accounting for 6% followed by wetlands, which account for 4% of total carbon held in plants.

The results of the carbon stock inventory informed the potential for GHG emissions reductions from measures and actions in the natural and working lands sector, which are described in further detail in Chapter 10. For more information on the carbon inventory methodology and results, please refer to Appendix B.



GHG emissions beyond the BARCAP region

Unlike local air pollution, GHGs impact our environment at the global scale. This means that in a globalized economy, the BARCAP region's actions have the potential to reduce not only GHG emissions within the region, but anywhere that supplies energy and materials consumed in the region. The GHG emissions inventory for the BARCAP categorizes and quantifies the GHG emissions produced or emitted within the geographic boundaries of the BARCAP region. However, this emissions inventory does not tell the whole story of the BARCAP region's impact on the global climate since a significant portion of the goods and services consumed by residents are produced outside the region.

To more fully describe the amount of GHGs generated by a region, a consumption-based GHG emissions inventory can be developed, similar to the one incorporated in the Air District's 2017 Clean Air Plan in collaboration with the Cool Climate Network at UC Berkeley.[19] This type of inventory is typically based on a full life-cycle analysis of the emissions generated by the production, use, and disposal of each activity or product. By estimating the GHG emissions embedded in the goods, services, and activities consumed by residents, regardless of where the goods were produced or the emissions were released, a consumption-based inventory provides insight into the full scale of the impact and benefit of GHG reduction actions.

There are currently several efforts to develop consumption-based inventories for the Bay Area and other regions of the state led by the Cool Climate Network which would provide a different view of the region's GHG impact.

ENDNOTES

1 This choice of base year reflects the best available data, for a vast majority of the source categories, including up-to-date (current) activity data, throughputs, emissions factors, impact of implemented controls, or actual reported and approved emissions (not a projection), or access to up-to-date national and statewide emissions inventories.

2 The Air District's complete GHG inventory includes nine counties, but the GHG inventory for the BARCAP excludes Santa Clara County to align with the geographic scope of this planning effort. Both inventories exclude the portions of Sonoma County and Solano County that fall outside the Air District's jurisdiction.

3 Gunnar Myhre et al., "Anthropogenic and Natural Radiative Forcing," in Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, ed. T. F. Stocker et al. (Cambridge: Cambridge University Press, 2013), 714, table 8.7, https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf.

4 An emission factor is a standardized value describing the mass of GHGs emitted per unit of activity. Activity data includes data such as vehicle miles traveled or landfill gas emitted; A throughput indicates how much material or fuel is being used, which directly influences the amount of pollutants released. E.g., a substance that is consumed during a process, and, while being consumed, produces emissions, such as the type and amount of waste processed at composting facilities or the amount of natural gas consumed for electricity production at power plants; A local control is a local rule or policy that limits emissions in ways not done by state and federal regulations, such as Air District Regulation 9 Rules 4 and 6 which aim to prohibit the use of space and water heating appliances that produce nitrogen oxides emissions, with co-benefits of reducing GHG emissions; "Regulation 9 Rule 4: Nitrogen Oxides from Natural Gas-Fired Furnaces – 2023 Amendment (Current)", Bay Area Air District, accessed September 4, 2025, https://www.baaqmd.gov/rules-and-compliance/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces; "Regulation 9 Rule 6: Nitrogen Oxides Emissions from Natural Gas-Fired Water Heaters – 2023 Amendment (Current)," Bay Area Air District, Accessed September 4, 2025, https://www.baaqmd.gov/rules-and-compliance/rules/reg-9-rule-6-nitrogen-oxides-emissions-from-natural-gasfired-water-heaters.

5 "California 2000-2022 GHG Inventory (2024 Edition)", California Air Resources Board, accessed October 30, 2025, https://ww2.arb.ca.gov/ghg-inventory-data.

6 With the adoption of SB1206 in 2022, HFCs will be phased-out in California by 2033, to be replaced with lower-GWP and/or non-GHG options. Senate Bill No. 1206, Skinner. Hydrofluorocarbon gases: sale or distribution; "SB 1206 and AB 663," California Air Resources Board, Accessed November 11, 2025, https://ww2.arb.ca.gov/our-work/programs/sb-1206-and-ab-663/about.

7 This scenario represents "what GHG emissions would look like if (the state) did nothing at all beyond existing policies that are required or already in place to achieve the 2030 target of at least 40 percent below 1990 levels. across all sectors statewide; "CARB 2022 Scoping Plan for Achieving Carbon Neutrality," California Air Resources Board, December 2022, https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf; More information on historical and future projections is provided in Appendix A.

8 "Regulation 9 Rule 4: Nitrogen Oxides from Natural Gas-Fired Furnaces," Bay Area Air District; "Regulation 9 Rule 6: Nitrogen Oxides Emissions from Natural Gas-Fired Water Heaters," Bay Area Air District; California's

Advanced Clean Cars II regulation and MTC-ABAG's Plan Bay Area 2050+ were not incorporated into the future projections of the inventory but are accounted for separately from GHG and co-pollutant emissions quantification of measures in the transportation sector.

9 "Community Choice Aggregation (CCA): What is it?" CALCCA, Accessed October 21, 2025, https://cal-cca.org/powered/.

10 "2022 Scoping Plan for Achieving Carbon Neutrality"; "Cap-and-Invest Program," California Air Resources Board, Accessed January 21, 2026, https://ww2.arb.ca.gov/our-work/programs/cap-and-invest-program; "Renewables Portfolio Standard – RPS," California Energy Commission, Accessed October 21, 2025, https://www.energy.ca.gov/programs-and-topics/programs/renewables-portfolio-standard.

11 "Regulation 9 Rule 4: Nitrogen Oxides from Natural Gas-Fired Furnaces – 2023 Amendment (Current)," Bay Area Air District; "Regulation 9 Rule 6: Nitrogen Oxides Emissions from Natural Gas-Fired Water Heaters – 2023 Amendment (Current)," Bay Area Air District.

12 The large peaks in the agriculture sector trendline are due to major fire events in 2017 and 2020.

13 "2025 Natural and Working Lands Cabon Inventory update", California Air Resource Board, accessed October 30, 2025. https://ww2.arb.ca.gov/our-work/programs/nature-based-strategies/natural-and-working-lands-carbon-inventory/2025-natural.

14 "APPENDIX I – NATURAL AND WORKING LANDS TECHNICAL SUPPORT DOCUMENT," California Air Resources Board, November 2022, https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-appendix-i-nwl-modeling.pdf.

15 The U.S. Environmental Protection Agency's (EPA) Greenhouse Gas Equivalencies Calculator was used to convert carbon held in NWL to carbon dioxide equivalent (CO_2-e) units in order to make this comparison. MT C is used throughout this section as opposed to MT CO_2-e, as carbon (C) is the standard unit of measurement used for carbon stocks in plants and soils used by the International Panel on Climate Change, State of California, and local Bay Area analyses. As described by the EPA Greenhouse Gas Equivalencies calculator, units of Carbon to CO_2-e are converted by multiplying by a factor of 3.67 based on molecular weight.

16 At certain points in this section, such as presenting total carbon stock values for plants and soils, units of carbon are converted into CO_2-e for the purposes of helping the reader understand their magnitude of importance compared to the GHG inventory and emissions reductions measures.

17 Biomass carbon describes carbon held in the total mass of organic material at a given time including both above and below ground live plant matter like roots, trunks, and branches, as well as dead plant material like litter and dead wood. Soil carbon describes the amount of carbon held in the top 30 centimeters of the soil column. Source: Appendix B Carbon Stock Inventory.

18 The U.S. Environmental Protection Agency's Greenhouse Gas Equivalencies Calculator was used to convert carbon held in NWL to carbon dioxide equivalent (CO_2-e) units in order to make this comparison.

19 The Bay Area Air District Consumption-based GHG Emissions Inventory can be accessed here: https://www.baaqmd.gov/en/about-air-quality/emission-inventory/consumption-based-ghg-emissions-inventory; The UC Berkeley CoolClimate Network's updated database can be accessed here: https://www.ecodatalab.com/.



3 GHG Emission Reduction Targets

The Bay Area Regional Climate Action Plan (BARCAP) is designed to complement climate planning efforts at the state, county, and city levels by focusing on filling gaps, addressing common challenges, building on, expanding, and accelerating climate solutions that are already underway in the BARCAP region. The BARCAP aligns with and supports achievement of the state's greenhouse gas (GHG) reduction targets. It also supports achieving targets set by other regional and local agencies.

3.1 STATE TARGETS

The BARCAP is aligned with and supports state targets. The State of California adopted the following GHG emission reduction targets, as established in statute:

- **40% below 1990 levels by 2030,** which translates to roughly 47% below 2005 levels;[1]
- **Carbon neutrality by 2045,** with at least 85% of reductions from 1990 levels from direct emissions reductions.[2]

Carbon neutrality is achieved when the amount of carbon dioxide emissions (CO_2) emitted into the atmosphere is offset by an equivalent amount removed, such as through sequestration, resulting in net-zero CO_2 emissions. To achieve this, the state's 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan) maps out a pathway that includes directly reducing GHG emissions by 85% and achieving the rest of the carbon neutrality target by removing carbon in the atmosphere and storing it through natural carbon sequestration as well as a variety of mechanical approaches such as direct air capture and carbon capture, utilization, and storage (CCUS). In the BARCAP, regional and local governments and partner organizations have focused on helping the state maximize direct GHG emission reductions and minimize reliance on CCUS in order to maximize the public health co-benefits of reducing dependence on fossil fuels.

3.2 REGIONAL TARGETS

Regional agencies in the Bay Area have adopted GHG reduction targets in support of the state's GHG reduction goals. Under Senate Bill 375, the Sustainable Communities and Climate Protection Act of 2008, the state set a Bay Area regional target for GHG emissions from passenger vehicles of a 19% reduction in per capita emissions below 2005 levels by 2035.[3] The Metropolitan Transportation Commission and the Association of Bay Area Governments' (MTC-ABAG) Plan Bay Area 2050+ aims to meet the state mandated target through strategies that integrate transportation and land use planning. The Air District adopted a regional GHG emissions reduction target aligned with the state's target in Assembly Bill 32 (2006) to reduce emissions 80% below 1990 levels by 2050. This target is reflected in the Air District's 2017 Clean Air Plan.

3.3 LOCAL TARGETS

Many local climate action plans in the Bay Area include equal or more stringent GHG reduction targets than the state. For example, some jurisdictions have set targets for net-zero emissions by 2030, fifteen years before the state plans to achieve carbon neutrality. Additionally, six out of eight counties and over 30 cities in the BARCAP region have declared climate emergencies, acknowledging the urgency of climate mitigation and prioritizing accelerated action.



- **By 2045,** the State of California plans to achieve carbon neutrality
- **By 2035,** the Bay Area plans to reach -19% per capita passenger vehicle GHG emissions relative to 2005
- **27 local climate action plans** set targets for GHG emissions reductions that surpass the state's targets
- **Nearly 40 cities and counties** in the BARCAP region have declared a climate emergency

ENDNOTES

1 SB 32 (2016); Rhodium Group, the Scoping Plan has a 2030 goal of 48% below 1990 levels (55.8% below 2005 levels).

2 AB 1279 (2022).

3 "SB 375 Regional Targets," California Air Resources Board, Accessed January 20, 2025, https://ww2.arb.ca.gov/our-work/programs/sustainable-communities-program/sb-375-regional-targets#:~:text=Senate%20Bill%20375%20requires%20CARB,if%20feasible%20to%20do%20so.



4 Engagement

Successfully achieving the Bay Area Regional Climate Action Plan (BARCAP) vision will require everyone.[1] The BARCAP engagement process provided a forum to hear from local governments, regional agencies, technical experts, community-based organizations (CBOs), climate solution implementers, frontline communities, and the general public. Local governments, regional agencies, and other potential implementers identified existing hurdles and standout opportunities for regional climate action. Giving frontline communities a seat at the table was critical to ensure that the actions in the BARCAP center environmental justice by improving the daily lives of frontline communities and minimizing unintentional harms to the extent feasible.[2] Engaging with the general public helped provide broad information on regional perspectives and values related to climate action.

The project team incorporated the knowledge gathered during engagement into the BARCAP to ensure it is both feasible and aspirational, reflecting the challenges and opportunities encountered by climate action implementers as well as the values of diverse communities across the BARCAP region. Implementing the BARCAP will require continuing and building on this foundation of thoughtful, collaborative engagement.

4.1 OVERVIEW OF APPROACH

The BARCAP region's large geographic area and diverse communities required an engagement approach with both breadth and depth, reaching across the BARCAP region while achieving a deep understanding of local priorities and concerns. The BARCAP region encompasses rural areas, farmland, and urban centers. It is diverse and populous – home to 5.5 million people, with a growing share of Asian, Pacific Islander, and Latino populations.[3] The Bay Area is one of the most diverse regions in the nation, with speakers of more than 160 languages, forty-three percent of whom speak a language other than English at home. Fifty-nine percent of the population identify as people of color, and there is a wide diversity of different racial and ethnic groups.

The BARCAP region is also home to over 80 climate action plans at the county, city, and town level across 88 jurisdictions in the BARCAP eight-county region.[4] Engagement activities helped determine how the BARCAP could complement and build on these local efforts and not duplicate them, in particular where there had been strong local engagement. The BARCAP engagement strategy sought to minimize potential 'engagement fatigue' experienced by community members, especially frontline community members, who have actively participated in local climate action planning efforts.

Key engagement goals

The following goals shaped the design of the BARCAP engagement strategy and helped ensure there was meaningful and iterative feedback from local governments, technical experts, frontline communities, potential implementers, and the general public.

- **Cultivate a shared understanding** about climate change and key areas for action
- **Gather perspectives and feedback** from community that are representative of the Bay Area
- **Strengthen community partnerships and center equity,** and build community-facing bridges to support future equitable implementation
- **Build on current and past progress** including the Priority Climate Action Plan (PCAP), local jurisdictions' recent climate plans and regional efforts to minimize duplication
- **Identify standout opportunities for regional climate action,** including key gaps and challenges to local climate action
- **Facilitate new conversations** and partnerships
- **Leverage insights and perspectives** from knowledgeable practitioners to inform key areas for action

The BARCAP engagement strategy thoughtfully deployed tools including surveys, multilingual workshops, CBO partnerships, interactive public commenting, and strategic meetings and work groups, which are shown in the infographic below. As a result, members of the public and frontline community members had the opportunity to provide feedback through multiple avenues while measures were being drafted. Technical experts, potential measure implementers, CBOs, nonprofits, local governments, and regional agencies were also engaged throughout BARCAP development.

In total, the BARCAP engagement process resulted in:



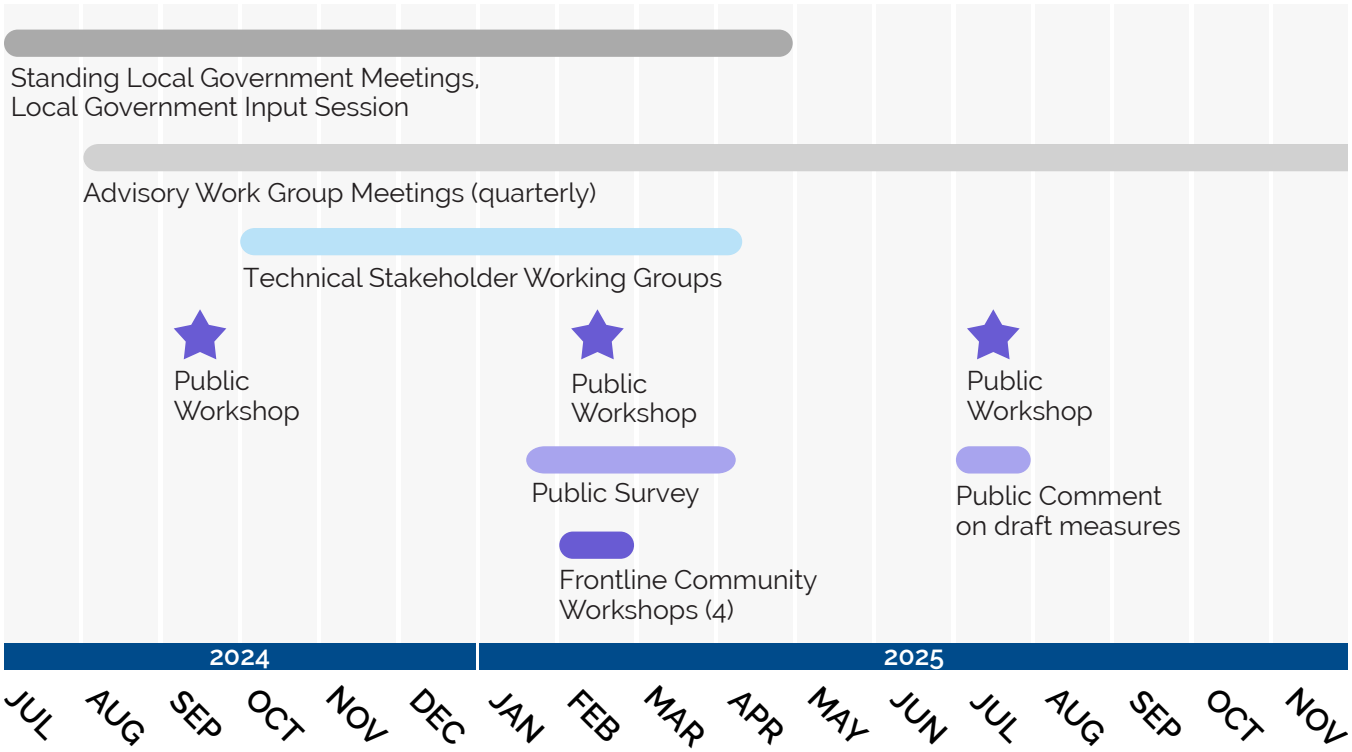
Key stakeholders & engagement toolbox

Each audience played a critical role in ensuring the BARCAP was **implementable, innovative, inspiring, additive (not duplicative), and centered on environmental justice**.

FRONTLINE COMMUNITIES: Influence design principles, measure development, community benefits and risks	**ENGAGEMENT TOOLS:** four subregional frontline community workshops, multilingual survey, community-based organization partnerships, public comment period, multilingual outreach
COMMUNITY-BASED ORGANIZATIONS AND ENVIRONMENTAL JUSTICE ORGANIZATIONS: Co-create design principles, advise project process, co-create and recruit community members to engage with priority community workshops	**ENGAGEMENT TOOLS:** roundtable, four subregional frontline community workshops, surveys, partnerships, public comment period, Advisory Work Group
LOCAL GOVERNMENTS: Identify key obstacles to local action that regional strategies could address, advise on process, shape and lead measures, provide technical expertise and highlight local climate actions already being implemented to avoid duplication, recommend local successes for potential scaling across the BARCAP region	**ENGAGEMENT TOOLS:** Advisory Work Group, technical stakeholder working groups (working groups), local government outreach
PUBLIC: Contribute to vision and measure development, understand and engage with project process, provide information on regional perspectives and values related to climate action	**ENGAGEMENT TOOLS:** three public workshops, survey, public comment period
TECHNICAL EXPERTS & IMPLEMENTERS: Ground measures and actions in on-the-ground realities, identify areas to advance regional leadership through BARCAP measure implementation	**ENGAGEMENT TOOLS:** technical stakeholder working groups

The timeline for BARCAP outreach is shown below in Figure 4-1.

Figure 4-1: Timeline of BARCAP Engagement Activities



The Air District hired a consultant team with extensive experience in public and community engagement to support implementation of the engagement strategy. Air District and consultant staff worked closely together and are referred to throughout this chapter as the project team.

4.2 ADVISORY WORK GROUP

An Advisory Work Group (AWG) met quarterly with the Air District to help inform decisions on key aspects of the BARCAP, connect the BARCAP to communities and local governments in AWG members' jurisdictions, discuss key challenges and important gaps to be addressed, and review key deliverables. AWG members also participated in the Technical Work Groups, described on the following page, and several contributed to the development of the engagement strategy. The Air District was able to leverage ongoing stakeholder engagement efforts led by AWG members, such as standing county-led local government meetings, and received support from AWG members for targeted engagement and information sharing with their networks as needed.

4.2.1 AWG members

The AWG was composed of representatives from regional agencies (Air District, Association of Bay Area Governments/Bay Area Regional Energy Network (ABAG/BayREN), Bay Area Regional Collaborative (BARC), and Metropolitan Transportation Commission (MTC)), two cities named in the federally-designated planning region (City of Oakland and City and County of San Francisco), the counties comprising the planning region (Alameda County, Contra Costa County, Marin County, Napa County, San Mateo County, and the portions of Solano County and Sonoma County that are within the Air District's jurisdiction), and several community-based and community-serving organizations (Canal Alliance, Climate Resilient Communities, Emerald Cities Collaborative Northern California, Rise South City, and Transform).[5] The full list of participants is available in Appendix E. The Air District also actively coordinated with Santa Clara County, the leader of the Climate Pollution Reduction Grant planning effort for the broader San Jose metropolitan area.

Figure 4-2: Members of Advisory Work Group



4.3 FRONTLINE COMMUNITIES

In order to center environmental justice in BARCAP outcomes and process, the project team and its partners sought to meaningfully engage frontline communities early in the plan development process. Key goals included strengthening community partnerships to center equity and facilitate implementation, and empowering and gathering perspectives and feedback representative of the Bay Area's diverse communities. Engagement was designed to give community members and CBOs a seat at the table, reflecting their position as experts in environmental justice, injustice, and the conditions needed for climate policy to improve the daily lives of their communities.

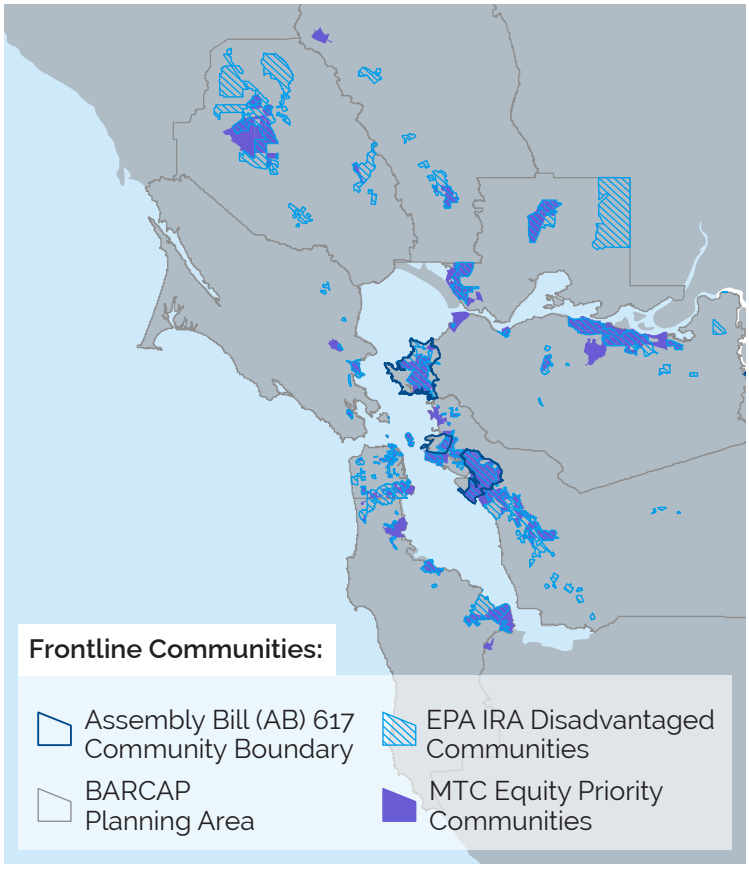
4.3.1 Defining frontline communities

The Air District identified frontline communities for the BARCAP, shown in Figure 4-3,

using a U.S. Environmental Protection Agency (US EPA) screening tool (US EPA Inflation Reduction Act Disadvantaged Communities tool) and two frameworks used by Bay Area regional agencies to identify priority communities for regional planning efforts: Assembly Bill 617 communities, and MTC Equity Priority Communities.[6]

4.3.2 Frontline community workshops

Figure 4-3: BARCAP Frontline Communities



Workshops were held in frontline communities early in the planning process before BARCAP measures were drafted. This allowed workshop participants to provide input on measures at the 'ground floor' and have a role in shaping design principles which were fundamental in guiding measure development. The input and findings gathered from these workshops were essential in shaping the draft measures.

To gather perspectives and feedback representative of the BARCAP region's frontline communities within the timeframe to inform the measures, the project team divided the BARCAP region into four subregions, each of which hosted a frontline community workshop. Eight CBOs were critical partners in planning the workshops, providing invaluable expertise and deep relationships with the communities they serve in the subregions. The CBOs co-developed the workshop agendas and multilingual materials to ensure that workshop content resonated with the needs of community members. CBO partners also recruited workshop participants, which was key in hearing the voices of the community and bringing multilingual community members to the table. The CBOs were compensated for their efforts, recognizing their expertise and role as part of the project team.

In addition to facilitating engagement, CBOs will be critical partners in implementation. Part of the vision for the community workshops was to engage CBOs in a meaningful way to begin building the long-term community partnerships needed to support equitable implementation across the BARCAP region. CBO partners and subregions are described on the following page in Table 4-1.

Table 4-1: Subregional Workshop Areas and Community-Based Organization Partners

FRONTLINE COMMUNITY WORKSHOP SUBREGIONS (COUNTIES)	COMMUNITY-BASED ORGANIZATION PARTNERS
Napa, Marin, Sonoma	North Marin Community Services Graton Day Labor Center
Alameda	Higher Ground Neighborhood Development Corporation Hayward Community Coalition (HayCoCoa)
Contra Costa and Solano	Citizen Air Monitoring Network Sustainable Solano Sustainable Contra Costa
San Mateo and San Francisco	El Concilio of San Mateo



The workshops occurred in the evenings to maximize participation, with options for dedicated Spanish and Cantonese discussion groups, and virtual and/or in-person participation as desired by the partner CBOs. Attendees received stipends for their participation. During the workshops participants brainstormed how preliminary areas of focus for BARCAP measures might impact their daily lives. Figure 4-4 shows a snapshot of participant discussions of risks and benefits of proposed areas for climate action from multilingual breakout rooms for Cantonese and Spanish speakers.

Figure 4-4: Snapshots of Community Feedback from Spanish and Cantonese Breakout Rooms

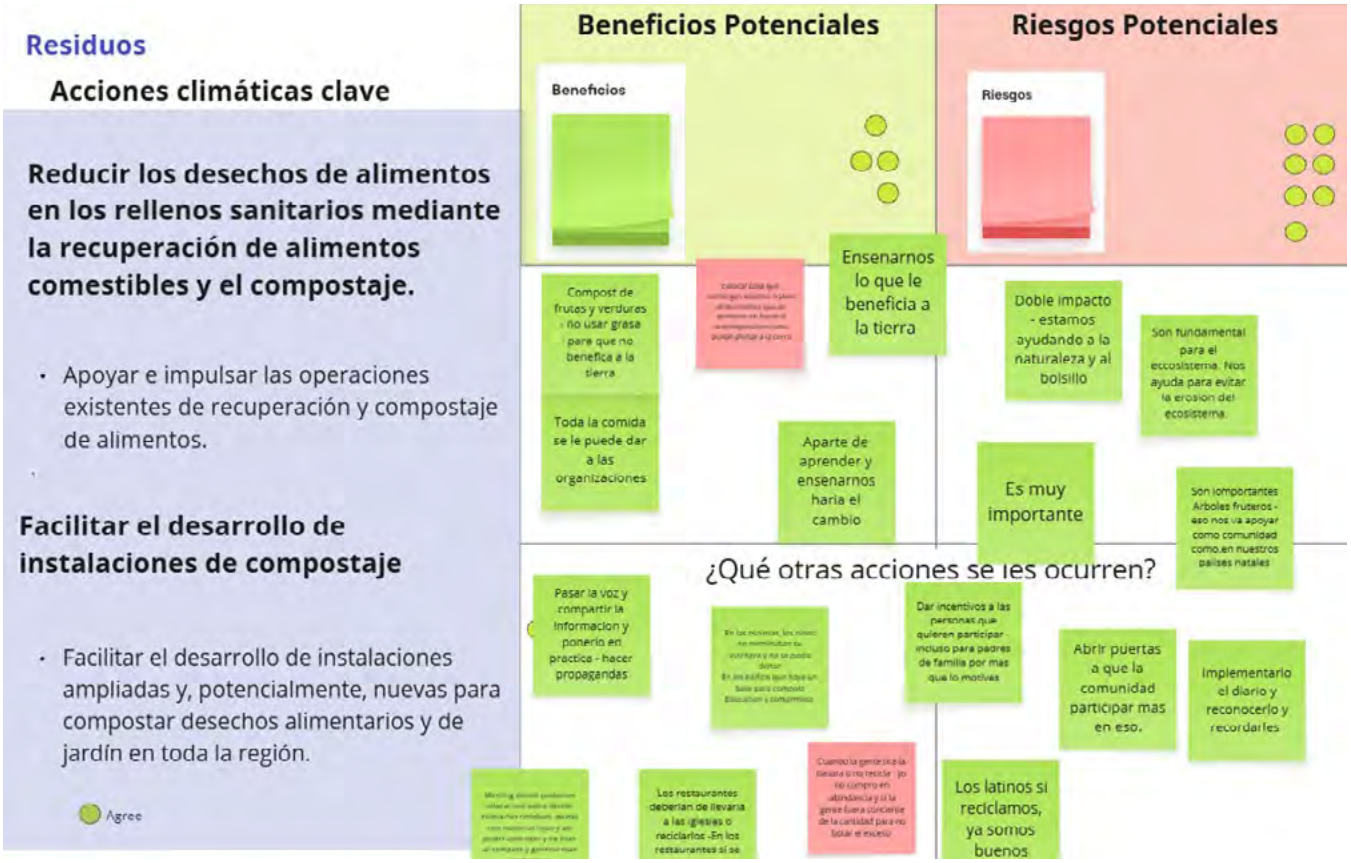




Figure 4-5: Key frontline community themes



Workshop participants also provided feedback on design principles used to guide measure development. The design principles were initially developed in 2023 in partnership with a roundtable of climate justice and equity organizations that served environmental justice communities: Emerald Cities Collaborative Northern California, The Greenlining Institute, PODER, and Transform. The principles were also informed by input from local governments and regional agencies based on what they have heard directly from their communities. Once updated to reflect feedback obtained through the workshops, the Air District assessed BARCAP measures against the revised design principles to ensure alignment with the underlying concepts. The full list of updated design principles can be found in Table 5-1 in Chapter 5- GHG Reduction Measures.

The Air District incorporated findings from the frontline community workshops, particularly the equity concerns, into draft BARCAP measures. The results are measures interwoven with language to center and advance equity, minimize unintended consequences, and lift up and amplify values and priorities identified by communities.

More information on key findings, community feedback, and the process for measure updates from each workshop is available in Appendix E.

4.4 LOCAL GOVERNMENTS

The Air District conducted extensive engagement with local governments in the BARCAP region, recognizing they are key stakeholders that may benefit from the BARCAP and also may serve as key implementation partners. Local governments provided unique insights into opportunities for the BARCAP to advance local climate action by addressing obstacles

and scaling solutions regionally while avoiding unnecessary duplication of efforts. They also shared important equity and implementation considerations. In total, 63 cities, towns, and counties (or roughly 71 percent of the total 88 cities, towns, and counties in the BARCAP region) participated in at least one engagement effort.

AWG members invited the Air District to attend regularly occurring local governments meetings between July and December 2024, including the Contra Costa County Sustainability Exchange, the Marin Clean Energy Partnership, San Mateo County Regional Climate Action Planning Suite Program, Sonoma Regional Climate Protection Authority, and StopWaste's Technical Advisory Group in Alameda County. The Air District attended nine meetings in total to present on BARCAP development and learn about local governments' specific needs and challenges that could be addressed at the regional level to advance local climate action. The Air District also asked local governments for input on what climate actions are more appropriately addressed on a regional scale versus at the individual jurisdiction level.

Local governments participated in other public engagement efforts including the public workshops and public survey, and the Technical Working Groups (working groups) (see member list in Appendix E). The Air District also hosted a virtual Local Government Input Session in April 2025 to garner feedback from local government staff on the preliminary draft measures, particularly asking about measure alignment with city and county efforts, potential local government roles in implementation, and identification of potential implementation challenges. Local governments provided comments during the public review process on the draft measures as well.



4.5 TECHNICAL WORKING GROUPS

To support the development of draft measures and actions for each sector, the Air District assembled and convened sector-level working groups. Members were invited based on subject matter expertise, their potential role as an implementation partner, and geographic diversity. Members included: regional agencies, local governments, community organizations, community choice aggregators and utilities, regional conservation districts, food recovery organizations, ports, subject matter experts, and others.

These working groups fostered broad-ranging conversations among practitioners that generated key insights and important perspectives to help shape measure development and implementation considerations. They supported the co-development of measures and actions for each sector, basing them in on-the-ground realities and identifying areas to advance regional collaboration and leadership. The working group process also helped ensure the measures aligned with BARCAP design principles, would lead to GHG reductions, achieve equity benefits, build on existing efforts, and were advantageous to implement at the regional scale. The working groups leveraged foundational desktop research conducted by the Air District in summer of 2024 assessing the existing policy, programmatic, and funding landscape for each sector (e.g., local climate action plans, the 2022 Scoping Plan, relevant state policies and programs), sectoral GHG emission profiles, key equity considerations, and potential sectoral gaps and opportunities for climate action.

Each working group met three to four times from Fall 2024 through Spring 2025, with smaller group discussions held between meetings as needed to explore and deliberate on specific topics in greater detail. Members for each sector's working group are listed in Appendix E.

4.6 PUBLIC ENGAGEMENT

Several avenues of engagement were made available to the general public to learn about and contribute to the development of the BARCAP, including public workshops, a survey, and a public review and comment period for the draft measures. The project team designed these engagement opportunities to gather information from the public on their perspectives and values related to climate action, cultivate a shared understanding around climate change and key actions, and seek their input on measure development. All public engagement opportunities were shared through the BARCAP listserv (voluntary email sign up list), existing networks (Air District and Advisory Working Group), and the Air District's social media channels. Materials were translated into Spanish and Chinese, and interpretation services were made available to encourage and facilitate participation by non-English speakers.

The project team convened three public workshops, which were held virtually in the early

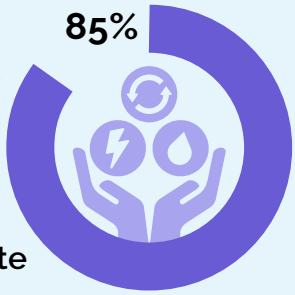
evening and focused on an overview of the BARCAP goals, vision, process, and timeline (September, 2024), a review of early measure concepts (February, 2025), and a deep dive into the draft measures and overview of the public review and comment online platform (July 2025). Strong support for aggressive climate action was expressed consistently at all three workshops. Participants voiced a sense of urgency to maximize all local government and programmatic levers to address climate change, while expressing concern over general affordability and rising costs of living.

To hear from a wider swath of the eight-county BARCAP region, beyond the reach of the frontline community and public workshops, the project team launched a public survey in Spanish, Chinese, and English. The survey was used to better understand community climate action values across the BARCAP region and gather feedback on priorities and concerns regarding the BARCAP's goals and early measure concepts. Across all respondent categories, climate resilience and public health were the most appealing benefits of climate action. More detailed information on survey results is available in Appendix E.

Once draft measures were developed, the project team launched a public review and comment period, utilizing an interactive online platform. Through this platform, the general public was able to review all draft measures and provide comments directly into the document. Comments were viewable by other commenters to enable discussions and deeper input. The public was also able to submit comments via email.

KEY ENGAGEMENT SURVEY FINDINGS

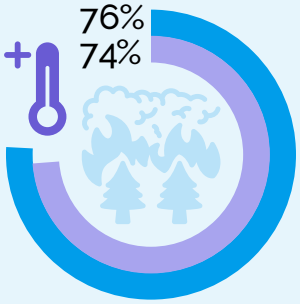
#1 action taken by respondents to support the climate and environment:
Save resources by using less energy, water, or reducing waste



Most observed local climate, environment, and weather pattern changes:

Increased frequency of regional wildfires and days affected by wildfire smoke

More frequent or intense heatwaves and hotter days



Strategies the Bay Area Regional Climate Action Plan should focus on:

59%
Produce energy for electricity using clean, carbon-free energy sources (e.g., solar, wind, geothermal)

★ *Top strategy for respondents across income levels*

49%
Expand and protect green spaces, urban trees, and natural ecosystems

★ *Top strategy for respondents across income levels*

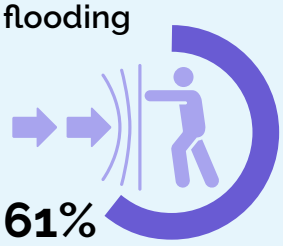
Top strategy for Hispanic, Latino, Latina, or Latinx respondents
***67%** support*

Top strategy for Black/African American respondents
***48%** support*

42%
Shift from driving an automobile to alternative transportation modes (walking, bicycling, transit)

Top strategy for Asian or Asian American respondents
***56%** support*

Top life improvements from actions to reduce GHGs and protect climate:
Communities that are better able to withstand climate impacts, such as extreme heat and flooding



Low-income households are more concerned about **additional cost burden** from climate action than wealthier households, especially where it may **contribute to displacement.**



Most appealing benefits of climate action:
Climate resilience and public health

Lower and middle-income households are:

More supportive of promoting local food production and **consumption, reducing food waste, and strengthening food security** than wealthier households

Less interested in transitioning to EVs than any other strategy

ENDNOTES

1 The BARCAP vision is "Together, we envision a Bay Area where achieving our climate goals fosters thriving communities, healthy natural systems, and a sustainable and prosperous economy. On the path to that future, we will create family-sustaining jobs, inspire innovation, improve air quality and public health, and prioritize environmental justice."

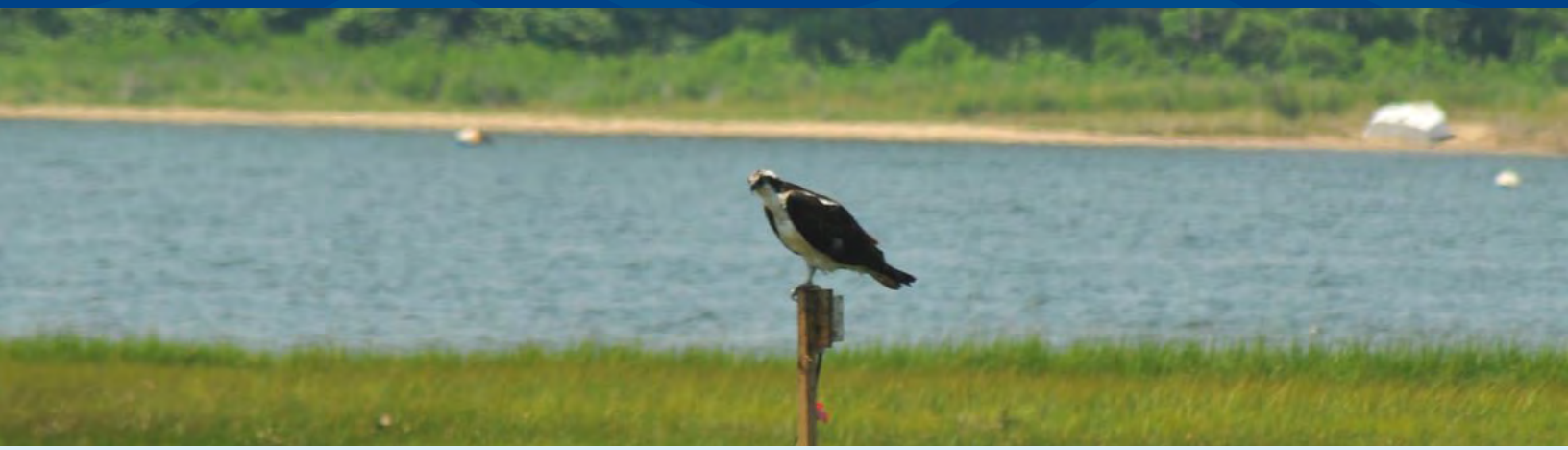
2 Frontline communities bear the brunt of the impact from fossil fuel dependence- and often experience climate impacts first and worst.

3 "Plan for Language Services to Limited English Proficient Populations," Bay Area Air Quality Management District, September 2023, https://www.baaqmd.gov/~/media/files/administration/non-discrimination/final_limited-english-proficiency-and-language-access-plan-lap_103123-pdf.pdf?rev=c62454abcf1346509de7b5fea9482c77&sc_lang=en.

4 This count includes climate action plans, resilience plans, adaptation plans, and climate change chapters in general plans. It also includes plans that may be outdated.

5 US EPA determined planning regions for the Climate Pollution Reduction Grant based on Metropolitan Statistical Area designations.

6 Frontline communities within the BARCAP region: https://experience.arcgis.com/experience/57bdb412b26e4f2eaf8fa762b735652f/page/Map/. For more information on the Air District's other mapping tools for healthy and equitable communities, please visit: https://www.baaqmd.gov/en/plans-and-climate/healthy-and-equitable-communities.



PLANNING FOR CLIMATE RESILIENCE IN THE BARCAP REGION

The BARCAP region is already experiencing the impacts of climate change, presenting urgent challenges for the region's environment, people, economy, and critical infrastructure. These impacts – extreme heat, wildfires and smoky air, sea level rise, heavy precipitation and flooding, and drought – are increasing in frequency and intensity.[1] Local governments, regional agencies, and community networks are responding with collaborative efforts to increase resilience to these climate impacts. The BARCAP, while focusing on reducing GHG emissions, also aims to maximize climate resilience benefits associated with implementation of the plan measures and actions.

Climate adaptation is how natural and human systems adjust to a new or changing climate.[2] This is frequently combined with the term "climate resilience" which is the capacity for individuals, communities, organizations or natural systems to prepare for disruptions, recover from shocks and stresses, and adapt and learn from them. Climate adaptation can include policies, programs, and on-the-ground projects that reduce projected hazard impacts.[3]

In response to these increasing threats, the Bay Area is building climate resilience through regional and local initiatives that emphasize benefits such as increasing workforce development, achieving air pollution reductions, and long-term sustainability measures. At the regional level, Metropolitan Transportation Commission/Association of Bay Area Governments' (MTC-ABAG) Plan Bay Area 2050+ and MTC's Multi-Jurisdictional Hazard Mitigation Plan guide long-term strategies for housing, transportation, and reducing risk from climate.[4] The Bay Area Climate Adaptation Network (BayCAN) further strengthens regional resilience by connecting local governments, agencies, and community partners to share best practices, coordinate, and advance equitable climate solutions across all nine counties.[5] In addition, most counties and cities in the Bay Area have climate adaptation plans and/or local hazard mitigation plans that aim to increase climate resilience. These plans ensure that resilience efforts are responsive to local needs while supporting broader regional goals.



There are also planning efforts tailored to specific, local conditions. Wildfire risk is addressed through county and multi-county prevention plans that focus on reducing hazardous fuels, enhancing emergency response capabilities, and prioritizing resources for the most at-risk communities. While there is no single regional plan for extreme heat, local governments and agencies have implemented a range of strategies, such as integrating climate action and hazard mitigation plans with mapping tools to identify and protect the most vulnerable neighborhoods. On a local scale, heat and climate action plans recognize the importance of urban greening, energy-efficient building retrofits, and resilience hubs to provide immediate cooling, improve air quality, and support community well-being.[6] The Bay Area Regional Energy Network's (BayREN) Extreme Heat Pilot Report provides data and recommendations to support partnerships and education on energy-efficient cooling solutions, while San Francisco's Heat and Air Quality Resilience Plan outlines targeted actions to reduce health risks from heat and poor air quality.[7]

Bay Area jurisdictions have also placed significant focus on sea level rise adaptation planning efforts. The San Francisco Bay Conservation and Development Commission released the Regional Shoreline Adaptation Plan, which lays out guidelines and standards for subregional shoreline adaptation plans and highlights priorities for sea level rise adaptation on a regional level.[8] Similarly, regional and local agencies are advancing extreme precipitation and flooding resiliency through coordinated planning and funding efforts, including the Bay Area Integrated Regional Water Management Plan, developed with the San Francisco Estuary Partnership.[9] To address drought, the East Bay Municipal Utility District and partner agencies have outlined a Drought Contingency Plan focusing on strengthening water supply, reliability, and emergency response.[10]

While the BARCAP focuses on climate mitigation, the resilience design principle emphasizes the plan's commitment to increase resilience in the region. Many climate resilience strategies outlined in the BARCAP—such as building decarbonization and nature-based solutions—not only reduce GHG emissions but also deliver public health and economic benefits. For example, building electrification can improve air quality and heat safety, while urban greening can reduce local temperatures and stormwater runoff. These strategies can also support job creation and equitable economic opportunity through workforce development programs, such as California Jobs First. By maximizing the climate resilience benefits of mitigation-focused measures, implementers of the BARCAP and partners can ensure the Bay Area strengthens both climate action and community well-being. Ongoing collaboration and proactive action across the BARCAP region are essential to safeguard people, the economy, and the environment for generations to come.

ENDNOTES

1 Louise Bedsworth et al., "California's Fourth Climate Change Assessment San Francisco Bay Area Summary Report," California Natural Resources Agency, 2018, https://www.energy.ca.gov/sites/default/files/2019-11/Reg_Report-SUM-CCCA4-2018-005_SanFranciscoBayArea_ADA.pdf; "Climate Change 2023 Synthesis Report Summary for Policymakers," IPCC, 2023, https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf.

2 California Governor's Office of Land Use and Climate Innovation.

3 Bay Area Regional Collaborative provided this description of climate adaptation and resilience.

4 "Final Plan Bay Area 2050, 2021," Plan Bay Area 2050+, Updated January 27, 2025, https://planbayarea.org/finalplan2050; MTC, "Multi-Jurisdictional Hazard Mitigation Plan (MJHMP)," Metropolitan Transportation Commission (MTC), Accessed August 5, 2025, https://mtc.ca.gov/operations/programs-projects/emergency-management/multi-jurisdictional-hazard-mitigation-plan-mjhmp.

5 "About BayCAN," BayCAN, Accessed June 24, 2025, https://www.baycanadapt.org/what-we-do.

6 "2025 Hazards and Climate Resilience Plan," Office of Resilience and Capital Planning, City and County of San Francisco, July 29, 2024, https://onesanfrancisco.org/sites/default/files/inline-files/2025_HCR_PublicReviewDraft_0.pdf.

7 "Heat Mitigation Pilot Research Final," Bay Area Regional Energy Network (BayREN), January 10, 2024, https://pda.energydataweb.com/api/view/3910/Final%20BayREN%20Heat%20Mitigation%20Report_2024_01_10.pdf; "HAQR The Heat and Air Quality Resilience Plan," San Francisco Department of Emergency Management, San Francisco Department of Public Health, and One SF, May 2023, https://media.api.sf.gov/documents/HAQR-2305221_0.pdf.

8 "Regional Shoreline Adaptation Plan: One Bay Vision, Strategic Regional Priorities, and Subregional Shoreline Adaptation Plan Guidelines," San Francisco Bay Conservation and Development Commission (BCDC), December 2024, https://www.bcdc.ca.gov/wp-content/uploads/sites/354/2024/12/regional-shoreline-adaptation-plan-spreads.pdf.

9 "Home," Bay Area Integrated Regional Water Management Program, Accessed October 16, 2025, http://bayareairwmp.org/.

10 "Bay Area Regional Reliability Drought Contingency Plan: Final Report," Bay Area Regional Reliability Partnership, December 19, 2017, https://www.bayareareliability.com/uploads/BARR-DCP-Final-12.19.17-reissued.pdf.



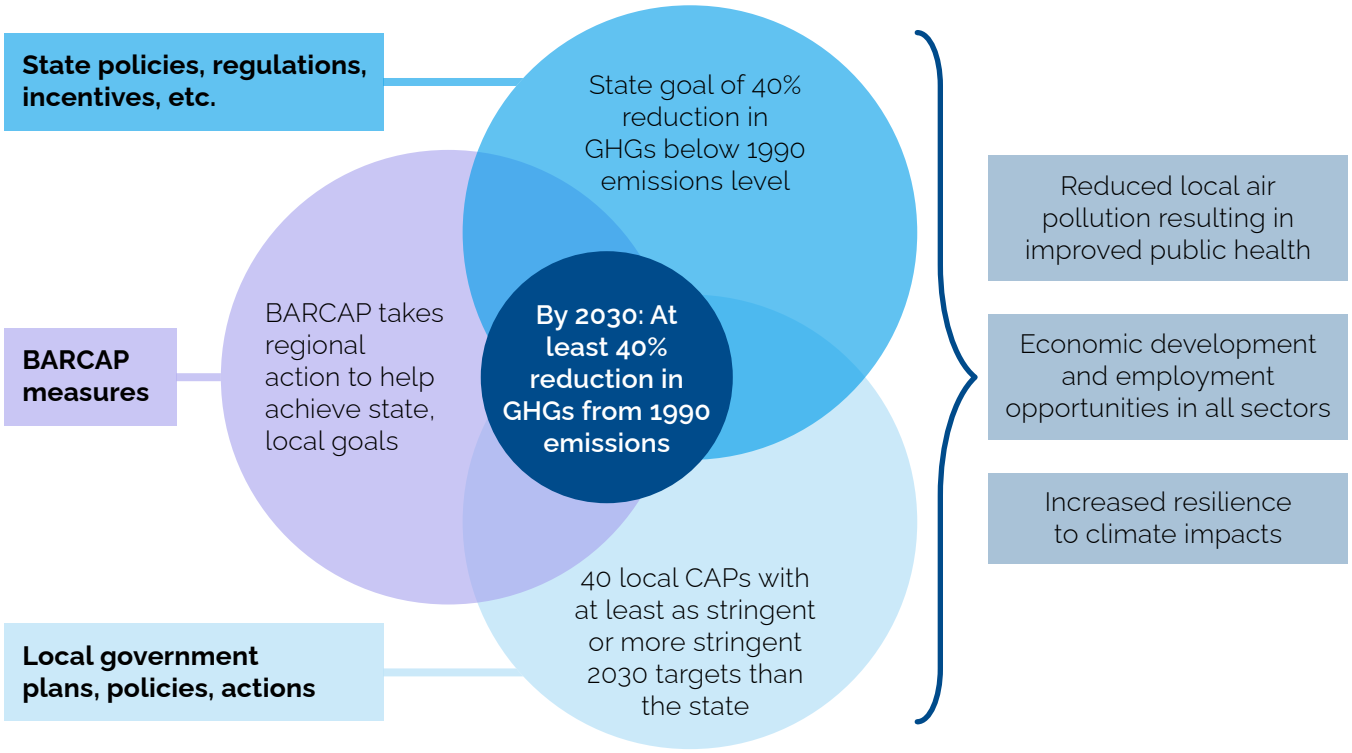
5 Greenhouse Gas Reduction Measures Overview

5.1 OVERVIEW

The Bay Area Regional Climate Action Plan (BARCAP) focuses on the following sectors where local governments and regional agencies have implementing authority: buildings, power, transportation, waste, and natural and working lands.[1] The BARCAP measures are designed to create enabling conditions that help make specific state and local government climate policies and goals more achievable in the BARCAP region and make implementation of regional and local actions more efficient, effective, and equitable. Some measures focus on what must happen regionally to support successful local implementation of state policies and initiatives and ensure that implementation is equitable and brings benefits to the BARCAP region. Other measures focus on removing barriers and building capacity to support local action and scale promising approaches regionally.

Figure 5-1 illustrates how the BARCAP fits into the existing climate action landscape of the eight-county BARCAP region, which already has ambitious goals and measures identified in the state's Scoping Plan and 80+ local climate change plans. The BARCAP seeks not to duplicate efforts, but to complement state and local actions to achieve shared goals. Together, measures from the state's 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan), the 80+ local climate action plans in the Bay Area, and the BARCAP will facilitate meeting the statewide target of reducing greenhouse gas (GHG) emissions 40% below 1990 levels by 2030. The measures and strategies used to achieve this goal will bring a host of additional benefits to the BARCAP region, particularly to frontline communities.

Figure 5-1: How the BARCAP fits in with state and local actions to achieve shared goals and outcomes



The measures in this plan are not an exhaustive list of all GHG emission reduction actions that can be taken in the BARCAP region. Instead, they are feasible, actionable, and broadly supported strategies that complement existing efforts, and when taken together with state and local action and sufficient funding, will help the BARCAP region achieve the state's 2030 emissions reduction target and accelerate its transition to carbon neutrality by 2045. The measure development process was guided by specific criteria (outlined on the following page) and informed by foundational research, the current implementation landscape, and robust stakeholder engagement to identify needs, priorities, concerns, and solutions.

The BARCAP is a plan that contains voluntary strategies and measures; it has not been adopted by the Air District's legislative body—the Board of Directors—and is not a regulatory plan. The Air District acknowledges that the measures or actions described in this plan may ultimately be implemented differently than described, due to changing circumstances including insufficient available funding or shifting political dynamics.

5.1.1 Measure criteria and design principles

All measures in the BARCAP meet the following criteria:

- Results in or enables **meaningful state, regional, and/or local GHG reductions** that might not be achieved otherwise;
- **Advantageous to be implemented regionally** and not duplicative of existing efforts;
- **Achieves key equity benefits** and advances the guiding values, or design principles on the following page (see Table 5-1);
- **Implementation ready** (i.e., implementation leads have been identified or the measure is in an approved plan or resolution, there is a realistic pathway to implementation, community/stakeholder acceptance and buy-in, etc.).

A set of nine design principles guided measure development. They were first developed in 2023 in partnership with a roundtable of climate justice and equity organizations that serve environmental justice communities: Emerald Cities Collaborative Northern California, The Greenlining Institute, PODER, and Transform. The principles were also informed by input from local governments and regional agencies based on what they have heard directly from their communities. The Air District further refined the design principles based on feedback in workshops with frontline communities and then assessed each potential measure and action against the principles to ensure alignment with the underlying concepts.



Table 5-1: Measure Development Design Principles

DESIGN PRINCIPLE
Climate equity: Provide direct, meaningful, desired, and assured benefits to frontline communities.
Cooperative: Build upon and integrate existing efforts to expand impact, rather than introduce duplication.
Coordinated: Build cooperation and peer working relationships among local government and community-based organizations that builds community capacity and empowers community leadership within and across counties, in consultation with community members through culturally relevant, multi-lingual, trusted-messenger-delivered outreach to reach frontline communities and other vulnerable groups including recent immigrants, Indigenous communities, and youth.
Funding & financing: Increase access to critical financing and funding mechanisms (including operations and maintenance) and identify alternative financing mechanisms that provide sustained benefits for frontline communities.
Genuine affordability & access: Increase access to housing, transportation, and other community benefits like green spaces, reduces or does not increase costs (e.g., housing, transportation, energy) and consider options to expand and improve access and affordability.
Health & safety: Improve living and/or working conditions (e.g., indoor and outdoor air quality, safety in green spaces, traffic safety, and pedestrian safety), especially in frontline communities.
Housing & community stability: Support people, especially renters and low-income homeowners, to be housed and remain in their homes. Consider how communities use and connect to spaces.
High-quality jobs & local entrepreneurship: Create lasting, high-quality, family-sustaining jobs and other pathways to economic sovereignty in frontline communities.[2]
Resilience: Build resilience especially for frontline communities to withstand changing climate conditions in the near and long term, increasing preparedness to respond to climate-related emergencies.

5.1.2 Measure development process

The measures were developed over a year and a half period, from May 2024 to September 2025. The Air District began the measure development process with foundational research to understand the existing policy, programmatic, and funding landscapes for each sector (e.g., local climate action plans, the 2022 Scoping Plan, relevant state policies and programs, funding opportunities and gaps) along with key equity considerations. When this research was combined with GHG emissions profiles for each sector, specific potential focus areas, gaps, and opportunities for action began to emerge.

The Air District and subject matter experts convened in technical working groups to consider the measure criteria and design principles, knowledge of the implementation landscape, and input from various engagement activities (as described in Chapter 4) to develop draft measures for the potential focus areas. The draft measures were refined with input from other potential implementing partners, frontline community benefits analysis, and other technical analyses.

5.2 IMPACTS OF MEASURES ON EMISSIONS AND COMMUNITIES



Implementation of the measures will result in GHG emission reductions and less air pollution in the BARCAP region. The measures are designed to help improve the daily lives and health of frontline communities by aiming to maximize potential benefits across five categories: public and community health, jobs and workforce development, climate resilience, decreased cost burdens, housing quality and security, and community engagement, awareness, and capacity.

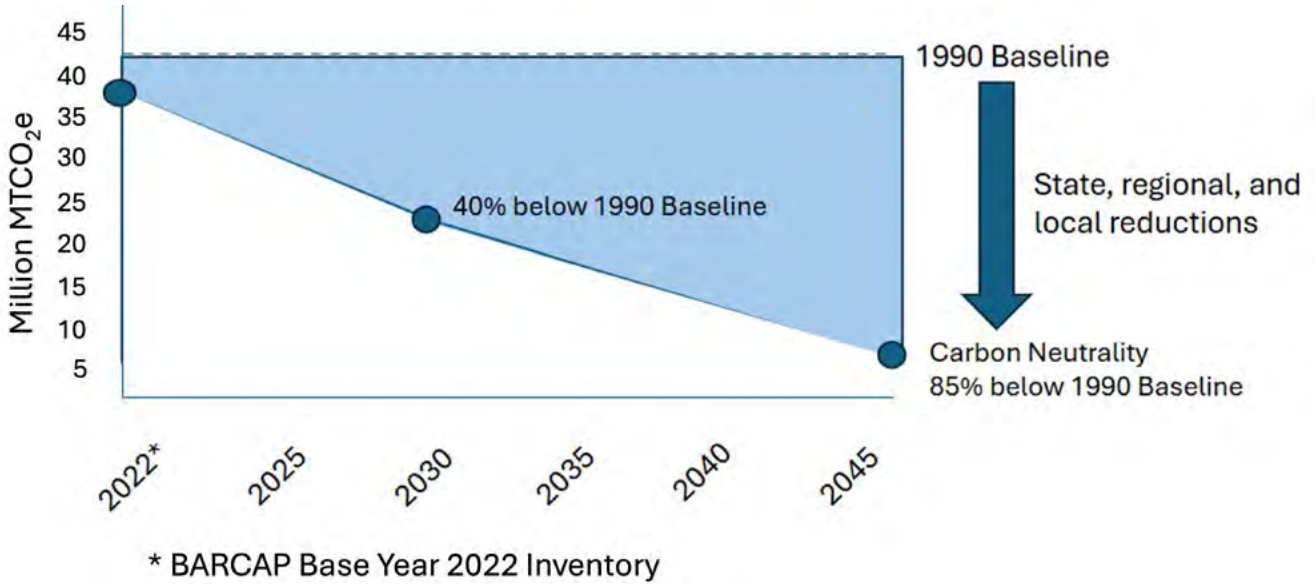
5.2.1 GHG emissions reductions

If the ambitious GHG reduction strategies in the state's Scoping Plan and local climate action plans are realized, the Bay

Area should be on target to reduce GHG emissions by 40% below 1990 levels by 2030 and achieve carbon neutrality by 2045. The BARCAP therefore focuses on complementing and enabling these strategies and filling gaps, rather than proposing duplicative actions in order to claim its own GHG reductions. Though some measures will have a direct GHG emission reduction on their own, emphasis was placed on removing barriers at the local level or complementing work at the state level. For example, in the transportation sector, installation of sufficient EV chargers for light duty vehicles is necessary to support successful implementation of the state's Advanced Clean Cars II (ACC II) regulation. The authority to permit chargers lies with local governments. BARCAP measures aim to support achieving the GHG emission reductions expected from ACC II by incentivizing the deployment of EV chargers and supporting local governments in developing and implementing policies that help accelerate the EV transition, such as permit streamlining. In addition, incentivising the lease or purchase of EVs, especially in frontline communities, will speed up the adoption of EVs, going beyond what is expected from state policies, resulting in direct GHG emission reductions when EVs replace internal combustion engines.

When taken together, the direct GHG emission reductions from the BARCAP measures plus additional reductions from state and local policies and programs – that are enabled by BARCAP measures – will result in meeting the state's GHG emission reduction goals, as shown in Figure 5-2. Put another way, policies, programs, and incentives at the state, regional, and local levels each play vital and complementary roles that contribute to a carbon neutral future.

Figure 5-2: BARCAP measures contribute to meeting GHG emission reduction targets through direct emission reductions and enabling reductions from state and local actions



5.2.2 Criteria air pollutant emission reductions

The BARCAP measures will also reduce emissions of criteria air pollutants, which pose serious risks to public health and the environment. These pollutants, which include ozone, particulate matter ($PM_{2.5}$ and PM_{10}), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), and lead, are common pollutants with widespread public health impacts, causing respiratory and cardiovascular diseases, asthma aggravation, and premature death. Their reductions are directly linked to clear public health benefits and regulatory air quality standards.

Criteria air pollutant emissions reductions associated with the BARCAP measures are shown in Table 5-2. These reductions are primarily the result of using less fossil fuels, such as natural gas in buildings and gasoline and diesel in vehicles. In contrast, reductions from natural and working lands (NWL) are not due to decreased emissions, rather they are primarily the result of removal (absorption) of air pollutants from other sectors.[3]

Table 5-2: Cumulative Changes in Criteria Air Pollutant Emissions in metric tons (MT), 2025-2045

POLLUTANT	CUMULATIVE REDUCTIONS FROM CHANGE IN ENERGY USE	REMOVALS FROM NWL
NO_x	11,463	85,554
SO_2	123	20,300
PM_{10}	630	143,734
CO	245,971	14,827
Lead	0.01	0

For more information on criteria air pollutant emission reductions and the quantification methodology see Appendix C.

Unlike criteria air pollutants, direct exposure to ambient levels of GHGs does not directly harm human health. Instead, GHGs have a secondary impact on human health by contributing to climate change which causes negative impacts on air quality and health. For example, rising temperatures due to global warming accelerate ozone and secondary particulate matter formation, and more severe wildfires due to warmer and drier conditions increase human exposure to harmful air pollutants. Additional discussions about climate and air quality-related health impacts are summarized in the textbox on page 74.

5.2.3 Frontline community impacts

The BARCAP measures are designed to generate meaningful benefits for frontline communities. Engaging these community members was critical in embedding equity into BARCAP measures, and developing the design principles that guided measure development, as frontline communities across the region often bear the brunt of

climate change impacts first and worst, while contributing the least to climate pollution. During the BARCAP engagement community members and community-based organizations (CBOs) uplifted how climate action must improve daily lives of Bay Area communities, especially those in frontline communities. These non-GHG benefits are often the primary motivation for these communities and those that serve them to support or take climate action. They shared specific benefits (and unintended consequences) that were most important to them, which helped inform refinement of the design principles and the scope of the frontline communities impacts analysis. At the same time, community members highlighted the urgent need to take climate action, and desire to be a part of advancing climate solutions. These considerations are woven throughout the BARCAP measures and actions, and an analysis was conducted to understand their potential impacts on frontline communities.

The potential benefits generally fall into one of five categories: housing quality and security, public and community health, jobs and workforce development, climate resilience, decreased cost burdens, and community engagement, awareness, and capacity. Implementation can also result in unintended consequences in these areas. While measures have been designed to maximize the benefits and minimize the unintended consequences to the extent feasible, the specific outcomes largely depend on how the measures are implemented. Embedding equity in implementation will be essential in avoiding unintended consequences. Potential benefits and unintended consequences for each measure are described in Chapters 6 to 10. For a more detailed analysis of potential frontline community impacts, see Appendix D. For a detailed description of the role of CBOs in workshops in frontline communities, and in creating design principles, see Appendix E.



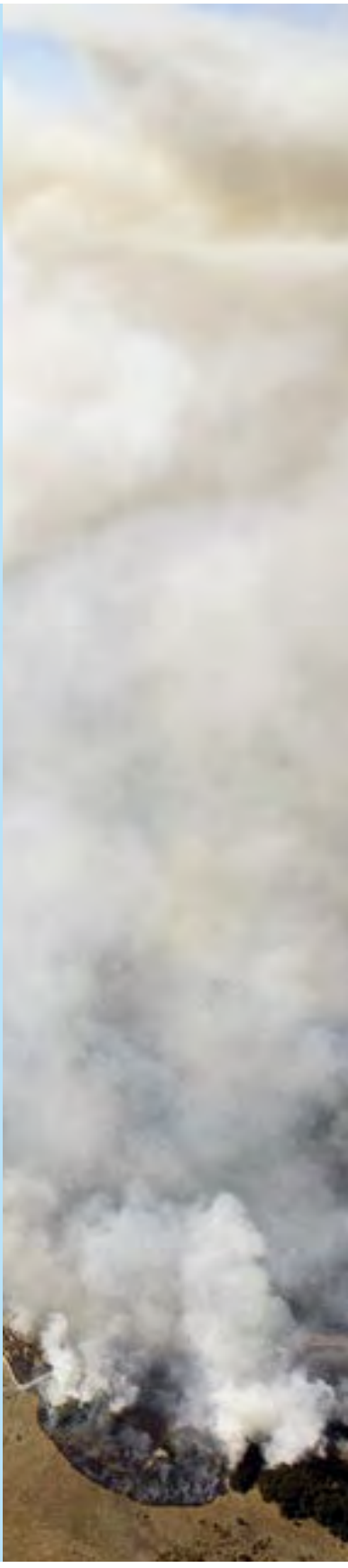
Greenhouse gases and public health

While direct exposure to the GHGs covered by the BARCAP at levels normally found in the outdoor air is not usually harmful to human health, these GHGs are the primary drivers of climate change.[4] **Climate change in turn can negatively affect public health and air quality in the Bay Area through multiple pathways.** Several are highlighted below; more complete information can be found in the Climate Change and Health Equity resources published by the California Department of Public Health, or Appendix G of the Scoping Plan published by the California Air Resources Board (CARB).[5]

Rising temperatures are increasing the frequency, intensity, and duration of extreme heat events. Heat exposure poses direct risks such as heat exhaustion, heat stroke, and cardiovascular stress. Higher temperatures also tend to worsen air quality, accelerating the evaporation of reactive organic gases and the photochemical reactions that produce ground-level ozone and secondary particulate matter (PM). Exposure to elevated ozone and PM levels leads to a wide range of serious and well-documented population health impacts, such as worsened asthma and other lung disease, hospitalizations, and even premature death.

Wildfires cause dramatic short-term spikes in pollution levels and significantly increase population exposure to PM and harmful combustion-related gases, including toxic air contaminants such as benzene. Smoke from wildfires causes a variety of short-term and longer-term impacts, including irritation of the eyes and respiratory tract, reduced lung function, bronchitis, asthma attacks, premature death, and worsened pregnancy outcomes. Wildfires can also impact human health through additional pathways, including psychological stress, physical injury, service disruptions, damage to housing, economic hardship, displacement, and loss of community cohesion. GHG emissions are intensifying the conditions that fuel wildfires, which are having more frequent and severe impacts on the Bay Area.

In addition to heat and wildfire-related impacts, climate change influences other health-relevant factors. For example, shifts in temperature and precipitation patterns and ecosystem health also affect water availability, food security, economic stability, infectious diseases, and the built environment in ways that indirectly shape public health outcomes. Climate-related disasters can result in school and work absences and impact mental health as well.





Not all Bay Area residents experience climate-related health impacts equally. **Communities of color, lower-income neighborhoods, working-class residents, and other historically marginalized groups and communities** often face both greater exposure to climate and air pollution hazards and greater susceptibility due to underlying social and health inequities.

For example, neighborhoods with predominantly Black or Latino residents tend to have fewer trees and more paved surfaces, making them hotter on average than wealthier, whiter neighborhoods. Similarly, asthma rates are disproportionately high among Black children, increasing the risks posed by wildfire smoke. These disparities reflect longstanding structural inequities such as housing discrimination, occupational segregation, and unequal access to resources including affordable healthcare and adaptive infrastructure.

Other populations who are particularly sensitive to the health impacts of climate change include older adults, infants and children, people with disabilities, individuals with chronic health conditions, unhoused people, outdoor laborers, immigrants, and people with limited English proficiency. The Air District is committed to working with communities and adopting policies and programs to address air quality and health disparities due to climate change.

5.3 SUMMARY OF MEASURES

Measures and actions are organized by **sector**: Buildings, Power, Transportation, Waste and Materials, and Natural and Working Lands. **Measures** outline the high-level strategy (e.g., expand and maintain urban green spaces), while **actions** describe the specific steps and initiatives needed to achieve the overall aim of the measures. Taken together, these measures and actions chart a path to reduce GHG emissions in each sector, as well as increase carbon sequestration in natural and working lands, and realize many other important benefits for the BARCAP region. Communities across the Bay Area expressed clearly during engagement efforts that these non-GHG benefits are often the primary motivation for action.

5.3.1 How to read the measure descriptions

For each **measure** in the following chapters, the BARCAP highlights the following points:

- **Summary:** description of the measure and how the measure helps address related challenges
- **Milestones for initiation:** key dates and next steps to initiate measure implementation during the next two years

GHG reductions in 2045: the expected GHG reductions from completing all actions under the measure in 2045 and/or accomplishing the overall aim of the measure.[6] GHG reductions are organized as:

Low **Medium** **High** **Supporting/not estimated**

Potential regional benefits: non-GHG reduction benefits likely to result from measure implementation

Design principles: identifies which design principles are advanced by the measure and actions

- Climate equity
- Cooperative
- Coordinated
- Funding & Financing
- Genuine Affordability & Access
- Health & Safety
- High-quality Jobs & Local Entrepreneurship
- Housing & Community Stability
- Resilience

Climate resilience benefits: highlights climate resilience benefits likely to result from measure implementation

Estimated costs of implementation: cost to implement from 2025-2045 as total cost to society[7]

✚ = Net savings
NE = Not estimated
S = Supporting (cost not estimated)
$ = $0-$100M
$$ = $100-$250M
$$$ = $250-$1B
$$$$ = $1B+

Proposed metrics: data to track for implementation of the measure

For each implementation **action** under a measure:

Action Title

Description to implement part of the measure

Lead Implementers: lead implementers will coordinate or manage the overall implementation of an action and/or lead one or more core components of an action.

Supporting Implementers: supporting implementers will participate in the implementation but will not take a leading role.

Timeframe to begin implementation: each action can start in the short-, medium-, or long-term (even though full implementation of the action may occur over a longer time period), depending on sufficient funding and staff resources



Short-term = all or part of the action can begin implementation within two years from plan finalization



Medium-term = all or part of the action can begin implementation within two to five years



Long-term = all or part of the action can begin implementation after five years



Ongoing = all or part of the action are already underway

5.3.2 Measure summary tables

The BARCAP is composed of 16 measures and 57 actions across five sectors, as shown in the tables below and described in more detail in the following chapters.

Table 5-3: Transportation sector measures and actions

Measure/ Action	Description
Measure T-1:	**Accelerate Light-Duty Electric Vehicle Adoption**
T-1.1	Expand incentives for the purchase or lease of 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
Measure 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
Measure 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
Measure T-4	**Support Implementation of Plan Bay Area 2050+**
T-4.1	Support alternatives to driving alone through land use, transit, biking, and walking strategies identified in Plan Bay Area 2050+

Table 5-4: Building sector measures and actions

Measure/ Action	Description
Measure 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 together 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 of 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

Measure/ Action	Description
Measure 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
Measure 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 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

Table 5-5: Power sector measures and actions

Measure/ Action	Description
Measure P-1:	**Increase Development of Local Clean Energy and Storage Projects (with a Focus on Small- to Medium-Scale Projects), 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 multifamily 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
Measure 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 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)

Table 5-6: Waste and materials sector measures and actions

Measure/ Action	Description
Measure 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
Measure W-2	**Advance Low-Carbon Building Materials and Reuse**
W-2.1	Collaborate with the state and local governments to implement the California Green Building (CALGreen) and CARB embodied carbon code requirements
W-2.2	Work with construction 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
Measure 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

Table 5-7: Natural and working lands sector measures and actions

Measure/ Action	Description
Measure 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

Measure/ Action	Description
Measure 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
NWL2.6	Support efforts to protect riparian forests, advancing land and water management strategies that maintain and increase carbon storage
Measure 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
Measure 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

ENDNOTES

1 The BARCAP does not include new measures or actions for the industrial sector as state law prohibits local air districts from mandating carbon dioxide reductions from facilities covered by the state's Cap-and-Invest program (formerly called Cap-and-Trade). The vast majority (85%) of industrial sector's GHG emissions in the BARCAP region are covered by the program.

2 According to the State of California's Future of Work Commission "Quality jobs provide a living wage, stable and predictable pay, control over scheduling, access to benefits, a safe and dignified work environment, and opportunities for training and career advancement"; Institute for the Future, "A NEW SOCIAL COMPACT for work and workers," California Future of Work Commission, March 2021, https://www.labor.ca.gov/wp-content/uploads/sites/338/2021/02/ca-future-of-work-report.pdf#:~:text=Ensure%20that%20more%20workers%20have%20quality%20jobs.,workers%20report%20being%20in%20a%20quality%20job.

3 Criteria air pollution emissions reductions were calculated using the EPA's i-Tree Landscape Module which estimates ecosystem services provided by increasing tree cover. The criteria air pollution emissions reductions for NWL do not include the impacts of wildfire reduction, climate beneficial agriculture (e.g. nitrogen fertilizer reduction), or other benefits from NWL measures.

4 Methane is a precursor for ozone, which is a health-damaging air pollutant.

5 "CLIMATE CHANGE AND HEALTH EQUITY," California Department of Public Health, Accessed November 18, 2025, https://www.cdph.ca.gov/Programs/OHE/Pages/Climate-Health-Equity/Health-Impacts.aspx.

6 For estimates of GHG reductions from measures in 2030, see Appendix C.

7 More information on estimated costs can be found in Appendix C.

6 Transportation Sector

6.1 Vision for 2045

6.2 Sector overview

6.3 Context

6.4 How proposed measures were developed

6.5 Transportation sector measures and actions

6.6 Funding implementation





6 Transportation Sector

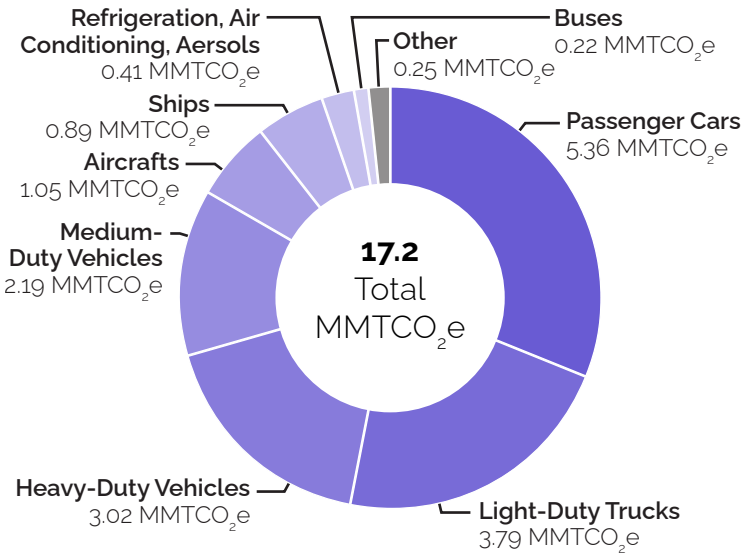
6.1 VISION FOR 2045

In 2045, the transportation sector is a well-connected, safe, and multimodal regional transportation network that prioritizes transit and active transportation, allowing people to connect more easily with where they live, work, and shop. Vehicles and equipment are zero-emission and fossil fuel use in the transportation sector is minimal.[1]

6.2 SECTOR OVERVIEW

The transportation sector includes on-road mobile sources (such as light-duty automobiles, drayage and heavy-duty trucks) and off-road mobile sources (such as transportation refrigeration units, locomotives, ships, and aircraft) whose primary objective is to transport people or goods from one place to another. Although locomotives, ships, and aircraft are included in the inventory for the sector, they fall under the regulatory authority of the state or federal government and have not been explicitly included in the measures for the Bay Area Regional Climate Action Plan (BARCAP). Additionally, greenhouse gas (GHG) emissions from off-road sources whose primary purpose is provide a service (such as lawn and garden equipment, construction equipment, ground support equipment, forklifts, and agricultural tractors) are included in other sectors.

Figure 6-1: GHG emissions by transportation sub-sector for BARCAP region in 2022



GHG emissions from the transportation sector were 17.2 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) in 2022 (or 32% of regional emissions). These emissions are predominantly from fuel combustion in on-road mobile sources, with passenger cars, light-duty trucks, heavy-duty vehicles, and medium-duty vehicles, the largest contributors accounting for approximately 31%, 22%, 18%, and 13% of total emissions from the sector, respectively (see Figure 6-1). GHG emissions from this sector decreased by 29% (7.1 $MMTCO_2e$) between 1990 and 2022 within the BARCAP region.

GHG emissions from on-road mobile sources are not the only emissions that can be credited to the transportation sector. When accounting for all transportation-related emissions, emissions from the refining of transportation fuels should also be considered. The inventory attributes these emissions to the industrial sector (refinery processes and direct combustion at refineries) and power sector (refinery-related cogeneration facilities). Given that these emissions are driven by fossil fuel use in vehicles, the full impact of transportation-related emissions in the BARCAP region in 2022 is higher than from combustion alone, an additional 11.3 $MMTCO_2e$, for a total of 28.6 $MMTCO_2e$ (or 53% of regional emissions). Chapter 2.1.3 and Appendix A describe the contribution of emissions from the refining of transportation fuels in more detail.

On-road mobile source GHG emissions have declined significantly over the past few decades despite a growing vehicle population and long-term increase in vehicle miles travelled (VMT) in the BARCAP region. This is largely due to more efficient vehicles. At the end of 2024, the BARCAP region had made progress electrifying the transportation sector. The BARCAP region is home to approximately 365,000 light-duty zero-emission vehicles which is approximately 10% of all light-duty vehicles in the BARCAP region and almost 26,000 public and shared, Level-2 and



direct current (DC) fast chargers to support those vehicles.[2] The number of medium- and heavy-duty vehicles in the BARCAP region is also growing with over 900 vehicles and over 1,500 private charging stations and over 90 public charging stations to support medium- and heavy-duty vehicles.

Even though progress has been made to electrify the sector, much work is needed to reduce vehicle miles traveled (VMT) throughout the BARCAP region as many of the area's highways cut through frontline communities, and this contributes to the health burden of these communities through increases in air pollution that result from tailpipe exhaust, brake and tire wear, and road dust. Additionally, although private vehicle trips have rebounded since the COVID-19 pandemic – as demonstrated by the Bay Bridge toll crossing numbers – transit ridership across the Bay Area is still greatly suppressed, with Bay Area Rapid Transit (BART) for the first six months of 2025 at only 43% of the average monthly ridership of the year before the pandemic.[3] This new reality for transit agencies across the Bay Area is one that creates significant funding challenges as they work to attract new and previous riders to their services.[4]

In order for the transportation sector to support population and economic growth in the BARCAP region into the future while protecting the health of the environment and our communities, there needs to be a transition to a transportation system primarily powered by zero-emission vehicles (ZEV) and zero- and low-carbon fuels coupled with increased opportunity for trips to be completed through biking, walking, and use of high-quality public transit.



Mobility hubs at affordable housing pilot

The Mobility Hubs at Affordable Housing pilot, led by Transform in partnership with from MTC-ABAG and Shared Use Mobility Center and funding from CARB, demonstrates how community-driven solutions can make sustainable transportation more accessible and equitable across the Bay Area. Located near affordable housing in San Jose, Richmond, and Oakland, the hubs bring together transit, bicycling, EV car share, and ride-hailing credits to meet residents' everyday travel needs. What sets this project apart is its deep community engagement: mobility offerings were determined by a community needs assessment and residents served on paid site level teams, acting as trusted ambassadors to design outreach, beta test services, and connect their neighbors with reduced-fare passes and shared mobility options.

With more than 4,600 residents served, over 13,000 free AC Transit rides taken, and $200,000 in travel incentives distributed, the hubs have already delivered tangible benefits. By pairing strong cross-sector partnerships with grassroots leadership, this model is both scalable and adaptable to other communities across the BARCAP region, offering a proven framework for expanding clean, affordable, and convenient mobility options.

6.3 CONTEXT



The primary method for reducing climate and air quality pollutants from on-road mobile source has been through vehicle emission and fuel economy standards, which have historically been set by three agencies at the federal and state level – U.S. Environmental Protection Agency (US EPA), the National Highway Traffic Safety Administration, and the California Air Resources Board (CARB). In addition to these regulations the state has a variety of funding programs aimed at ZEVs and equipment as well as the associated charging and alternative fueling infrastructure. These incentive programs are primarily through CARB and the California Energy Commission (CEC) and include Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project, Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles Project, California Electric Vehicle Infrastructure Project and others.

Transportation solutions to reduce GHG emissions can be grouped into one of three categories, per CARB's 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan): vehicle miles traveled, fuels, and technology.[5]

- ***Vehicle Miles Traveled (VMT)*** refers to the measure of distance a vehicle travels;
- ***Fuels*** refer to the source of energy used to power vehicles and equipment;
- ***Technology*** refers to vehicles as well as the associated charging or fueling infrastructure.

Reducing the miles people need to drive daily from their homes to work, school, or key services is critical for a more sustainable, zero-carbon, and multi-modal transportation future. Land use, transit, bicycle, and pedestrian policies can reduce VMT, GHG emissions, and air pollution emissions.

The Bay Area is a leader in transportation planning that favors transit and active modes of transportation and considers environmental and equity impacts. The Bay Area is unique in that it has a visionary long-range integrated transportation, housing, economic, and environmental plan – Plan Bay Area (PBA) 2050+, developed by the Metropolitan

Transportation Commission and Association of Bay Area Governments (MTC-ABAG).[6] PBA 2050+ aims to have nearly half of all Bay Area residents (and 70% for low-income households) living within one half-mile of frequent transit by 2050, in order to make the Bay Area more affordable, connected, diverse, healthy, and vibrant, with a focus on equity outcomes.[7] Implementation of PBA 2050+ strategies, especially those that focus on active and shared travel modes, combined with the transit-supportive land use pattern in PBA 2050+, are forecasted to significantly decrease per-capita GHG emissions, meeting the state-mandated 19% reduction in per-capita GHG emissions from transportation below 2005 levels by 2035 for the Bay Area region.

The state is focusing on ensuring that an adequate supply of zero-carbon alternative fuels and distribution infrastructure is available to meet the needs of ZEVs into the future. Electricity and hydrogen are currently the primary fuels for ZEVs and both must be produced using low-carbon technology and feedstocks to minimize emissions. The transition to ZEVs will not happen overnight and the state expects conventional vehicles from legacy fleets to remain on the road for some time. As such, in addition to building the production and distribution infrastructure for zero-carbon alternative fuels, the state plans to continue to support low-carbon liquid fuels during this period of transition and for more challenging functions for ZEV technology such as aviation, locomotives, and marine applications. The state is addressing this through investments in the production and distribution of low- and zero-carbon fuels and through the Low Carbon Fuel Standard.



The state's Executive Order N-79-20 calls for 100 percent ZEV sales of new light-duty vehicles by 2035; sets targets for transitioning the medium- and heavy-duty fleet to zero emissions by 2035 for drayage trucks and by 2045 for buses and heavy-duty long-haul trucks, as feasible; and 100 percent sales of new off-road vehicle and equipment by 2035, as feasible. The Scoping Plan reflects these targets, and CARB has a number of regulations to fulfill these goals that serve as the primary mechanism to help deploy ZEVs. Specifically for light-duty EVs, the state has set a goal of 7.1 million EVs sold by 2030 and the Air District has set a target of 90% of vehicles in the Bay Area being zero-emission by 2050.[8] Efforts at the federal level in 2025 to repeal waivers granted to California through the Clean Air Act to facilitate the state in meeting these targets has demonstrated the importance of regional and local governments continuing to focus on zero to low emission solutions for the transportation sector to ensure we meet our climate goals.



Deploying sufficient charging and fueling infrastructure to support ZEVs is critical in meeting these targets. It is also critical to focus on equity to ensure that the transition to ZEVs is affordable for low-income households and frontline communities and that those communities benefit most from the air quality co-benefits of the transition. The Scoping Plan identifies this as a key role for local governments.

Based on feedback from public engagement conducted during the development of the BARCAP, there is strong regional support for active transportation (public survey results ranked this third out of 13 potential focus areas for climate action). The transition to electric vehicles was comparatively less popular among survey respondents (public survey results ranked this tenth out of 13 potential focus areas for climate action).[9] Members of the BARCAP region's frontline communities who participated in the BARCAP engagement process expressed concerns around EV charging reliability and accessibility, costs of EVs, range anxiety, and theft of parts. Additionally, while interested in expanded access to transit, biking, and walking, they had concerns about bike safety. Projects to expand roadways and increased e-commerce leading to increased VMT from goods movement were also concerns.

Embedding equity into the core of transportation sector measures is essential to ensure that the benefits of decarbonization and mobility improvements are shared across all communities. Historically, low-income residents and communities of color in the Bay Area have experienced disproportionate exposure to air pollution, higher portion of their income going toward transportation costs, and limited access to safe, reliable mobility options. As the BARCAP region transitions toward zero-emission vehicles, low- and zero-carbon fuels, and expanded active and public transit, policies must be designed to reduce barriers for frontline communities and prioritize investments that improve air quality, affordability, safety, and connectivity.

6.4 HOW PROPOSED MEASURES WERE DEVELOPED

As described in Chapter 4, measures and actions for the transportation sector were developed with extensive input from the public, frontline community members, Advisory Work Group members, and members of a technical stakeholder working group. The technical stakeholder working group was comprised of 11 subject matter experts representing local governments, Community Choice Aggregators, regional agencies, and community-based organizations. These technical experts grounded measures in the current implementation landscape (including key hurdles and areas for action) and helped develop and refine the proposed measures and actions in collaborative meetings over six months. See Chapter 4 for an overview of BARCAP's sector-level technical working groups.

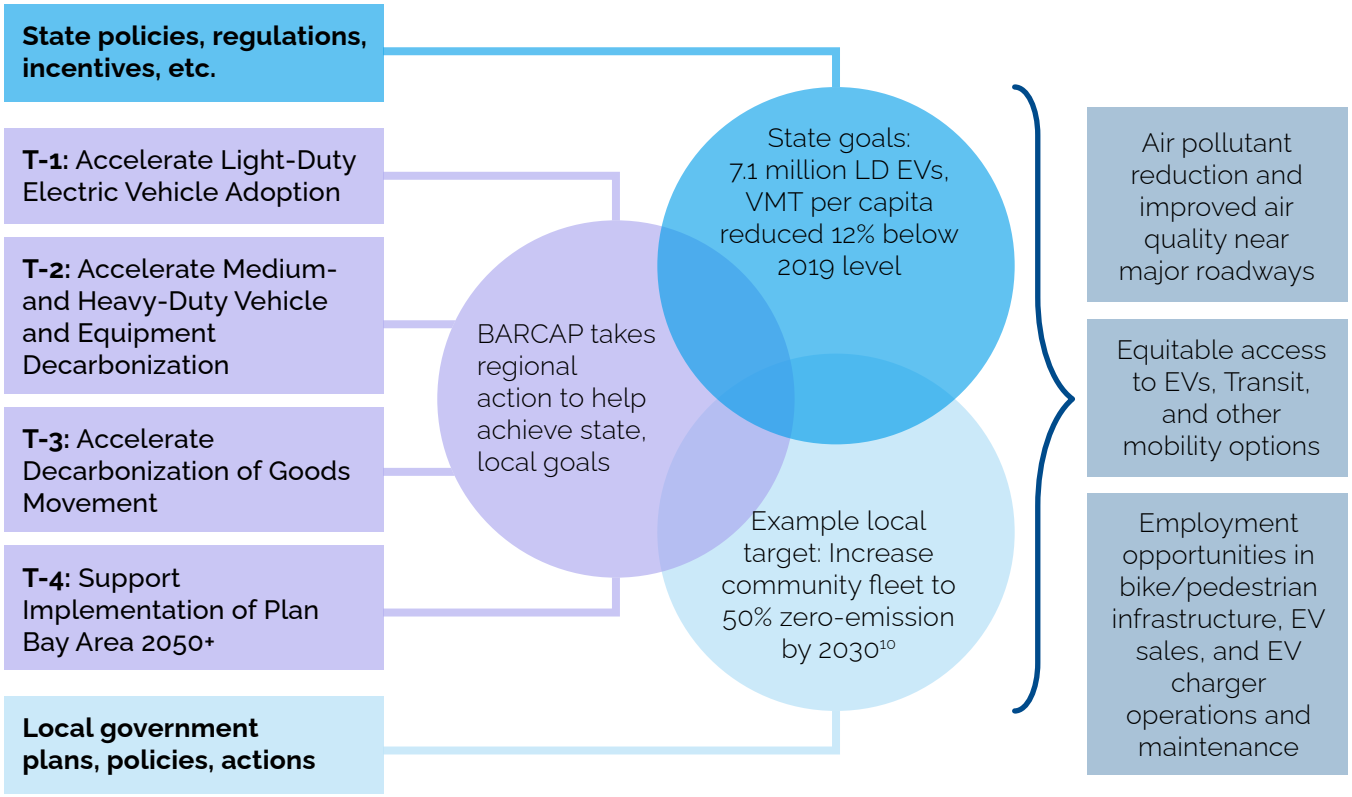
The measures described on the following page can be implemented with implementing partners' existing authorities.



The BARCAP focuses on accelerating the decarbonization of vehicles and equipment through policies and programs that incentivize zero-emission vehicles and deploy the charging and fueling infrastructure to support those vehicles, including vehicles and equipment used for goods movement. Additionally, the BARCAP supports implementation of Plan Bay Area 2050+, focused on per-capita VMT reductions through land use, transit, biking, and walking strategies for the BARCAP region.

6.5 TRANSPORTATION SECTOR MEASURES AND ACTIONS

Figure 6-2: Transportation measures contributing to state and local goals



The measures and actions for the transportation sector contribute to achieving state and local goals for the sector and result in many other key benefits. As shown in Figure 6-2 they complement, rather than duplicate, state and local actions in important ways. The measures and actions support successful local implementation of state policies and initiatives in ways that are equitable and bring benefits to the BARCAP region. They also help remove barriers and build capacity to accelerate local action and scale promising approaches regionally.



Measure T-1: Accelerate Light-Duty Electric Vehicle Adoption

GHG reductions in 2045:
Low *(see Figure 6-2 for an illustration of the GHG emission reductions enabled by these measures and actions and Appendix C for quantified reductions)*

Potential regional benefits:
- \+ Reduced exposure to air pollution
- \+ Health benefits
- \+ Reduced cost burden
- \+ Increased access to services
- \+ Job creation

Design principles:

Climate resilience benefits:
Charging locations should be at sites that have been evaluated for resilience and that support community access to essential services during or after a climate event

Estimated costs of implementation:
$$$$

Proposed metrics:
Percentage of registered light-duty EVs in the BARCAP region, number of Level-2 and DC fast chargers installed (total and in frontline communities)

SUMMARY

Support the acceleration of light-duty electric vehicle (EV) adoption through expanded incentives for EVs, coordinated planning for EV charging locations and installation of EV chargers to meet expected demand across the BARCAP region, and expanded support for low-income residents, frontline communities, and local governments in adopting EVs.

This measure helps to address issues related to the cost of vehicle electrification in low-income residents and frontline communities, ensuring they aren't left behind in the transition to clean transportation.

Milestones for Initiation:

Initiation dates assume funding and staff resources are available and obtained. If not, shifting initiation dates may be necessary.

- **Q3 2026 –** Obtain additional funding
- **Q3 2026 –** Update funding programs to include e-micromobility
- **Q3 2026 –** Expand funding availability for the purchase of EVs and EV charging
- **2027 –** Expand community outreach, education, and technical assistance to increase participation in EV funding programs

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Public and Community Health

✚ Reduced exposure to health-damaging pollution from fossil fuel-powered vehicles

✖ *Does not reduce exposure to other vehicle-related emissions, e.g., brake and tire wear and road dust, which are already occurring with current vehicles*

Jobs and Workforce Development

✚ Employment opportunities in e-micromobility, EVs, and electric infrastructure

✖ *Reduced employment in servicing internal combustion engine vehicles and fleets as well as at fueling/gas stations*

✖ *Employment opportunities could be challenging for low-income and disadvantaged jobseekers to secure without the necessary training for this new market*

Community Engagement, Awareness, and Capacity

✚ Increased understanding, awareness and engagement in climate solutions, improved trust between communities and 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*

Climate Resilience Co-Benefits

✚ Increased access during climate-related emergencies if charging infrastructure is sited at trusted local institutions (e.g., schools, community centers)

Housing Quality and Security

✖ *Risk of displacement or gentrification where charger deployment and EV adoptions are concentrated*

Costs Burden

✚ Decreased transportation cost burden

✚ Cost savings when gas prices rise

✖ *High electricity rates can reduce savings achieved*

✖ *Higher upfront costs for EVs*

✖ *Reliance on public charging can be more expensive*

✖ *Limited benefit for non-car owners since many low-income residents rely on transit, walking or biking*

ACTIONS

T-1.1: Expand incentives for the purchase or lease of EVs

Include e-micromobility (e-bikes, e-scooters, etc.) and pre-owned EVs, especially in frontline communities and for low-income residents to lower upfront costs of EV purchase.

Proposed Lead Implementer:
Air District

Proposed Supporting Implementers:
Air District, Community Choice Aggregators, MTC, CARB

Timeframe to start implementation:
Medium-term



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

Include a focus on deploying DC fast and multifamily charging in charging deserts and key commute routes to accelerate the adoption and use of EVs and to help reduce range anxiety and provide greater accessibility, especially in frontline communities. Actions may include:

- **Exploring the feasibility of municipalities or Community Choice Aggregators providing non-monetary incentives,** such as subsidized or lower lease rates, providing make-ready infrastructure subsidies, and guaranteeing power availability in areas served by publicly owned utilities;
- **Securing funding for planning/technical assistance** or direct-install programs for multifamily properties and smaller businesses/nonprofits interested in hosting public or workplace charging sites;
- **Securing funding for ongoing maintenance** to keep chargers available and operational;
- **Securing funding for low-cost, Level-1 charging** at multifamily properties;
- **Exploring including charger uptime requirements** when funding public charging stations to improve availability, performance, and accessibility;
- **Working with communities to identify trusted institutions** for locating low-cost, community-facing EV charging.

Proposed Lead Implementer:
Regional agency

Proposed Supporting Implementers:
Air District, MTC, Community Choice Aggregators, CARB, CEC, county transportation agencies, SCTCA, local governments, utilities

Timeframe to start implementation:
Medium-term



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

Actions may include:

- **Expanding programs** to directly assist low-income households, affordable housing developers, and community-based organizations with funding applications and grant writing;
- **Supporting light-duty fleet electrification** for small merchants, Transportation Network Company drivers (e.g., Uber, Lyft), etc.; support charger installation site hosts such as community centers;
- **Ensuring community outreach and support is culturally relevant and multi-lingual**; include information about comparative costs for operations and maintenance of EVs, EV safety issues, theft issues, and range-anxiety;
- **Working to better understand immigrant community needs** for incentives support including how submitting required paperwork could negatively impact their lives.

Proposed Lead Implementer:
Grid Alternatives

Proposed Supporting Implementers:
Air District, MTC, Community Choice Aggregators, community organizations

Timeframe to start implementation:
Short-term/Medium-term

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

Include local government approaches that may involve strengthening local requirements for new developments or parking facilities to include EV charging infrastructure; simplifying and expediting the permitting process for charger installations to reduce delays and costs; designating EV charging zones, prioritizing public right-of-way access for chargers, or implementing preferential parking policies.

Proposed Lead Implementer:
Regional Agency

Proposed Supporting Implementers:
MTC, SCTCA, local governments, community organizations

Timeframe to start implementation:
Short-term/Medium-term



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

GHG reductions in 2045:
Low *(see Figure 6-2 for an illustration of the GHG emission reductions enabled by these measures and actions and Appendix C for quantified reductions)*

Potential regional benefits:
- \+ Reduced exposure to air pollution
- \+ Health benefits
- \+ Job creation

Design principles:

Climate resilience benefits:
A more resilient transportation system that is less vulnerable to disruptions in fuel supply chains

Estimated costs of implementation:
+

Proposed metrics:
Number of zero-emission medium- and heavy-duty vehicles replaced and/or purchased, number of charging and fueling hubs deployed

SUMMARY

Accelerate zero-emission medium- and heavy-duty vehicles and equipment adoption through expanded incentives, coordinated deployment of EV chargers and fueling infrastructure to meet expected demand across the BARCAP region, while incorporating the needs of low-income and frontline communities.

This measure helps to ensure that medium- and heavy-duty vehicles continue to electrify given that the state has withdrawn the request for a federal waiver and authorization of the Advanced Clean Fleets rule. The measure leverages existing programs such as the Carl Moyer Program to ensure there is continued funding to expedite the transition to clean vehicles and equipment.

Milestones for Initiation:

Initiation dates assume funding and staff resources are available and obtained. If not, shifting initiation dates may be necessary.

- ★ **Q4 2026 –** Identify opportunities to expand funding
- ★ **Q4 2026 –** Develop programs to fund the purchase of medium- and heavy-duty EVs and charging/fueling infrastructure
- ★ **Q4 2026 –** Identify fleets that could act as anchor tenants at charging/fueling hubs
- ★ **2027 –** Outreach to fleets identified to encourage them to be anchor tenants

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Public and Community Health

- ✚ Reduced exposure to health-damaging pollution from fossil fuel powered vehicle tailpipe emissions
- ✚ Noise reduction in neighborhoods where diesel trucks and equipment operate
- ✖ *Does not reduce exposure to other vehicle-related emissions, e.g., brake and tire wear and road dust, which are already occurring with current vehicles*
- ✖ *Potential air quality impacts from additional brake and tire wear or road dust if charging/fueling hubs are located in frontline communities*
- ✖ *Incentives for the purchase of new trucks, instead of replacing existing trucks, could lead to the expansion of EV fleets and increased truck traffic*

Jobs and Workforce Development

- ✚ Employment opportunities in electric truck maintenance and electric infrastructure
- ✖ *Employment opportunities could be challenging for low-income and disadvantaged jobseekers to secure without the necessary training for this new market*
- ✖ *Existing internal combustion engine fleet maintenance jobs would become obsolete*

Climate Resilience Co-Benefits

- ✚ Local charging and fueling hubs may increase energy resilience by reducing dependence on fossil fuel supply chains

Costs Burden

- ✚ Potential lower long term maintenance costs for fleet operators
- ✖ *Unstable or increased fueling/charging increase risk, especially for small fleet operators*
- ✖ *Electricity cost and reliability concerns if high power demand from large charging hubs raise local utility costs or stress the grid*

ACTIONS

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

Actions may include:

- **Targeting incentives** to electrify equipment at marine ports and airports;
- **Creating a streamlined voucher incentive program** to electrify small fleets of heavy-duty trucks;
- **Increasing participation from operators** of older and dirty heavy-duty diesel vehicles and equipment that operate in frontline communities.

Proposed Lead Implementer:
Air District

Proposed Supporting Implementers:
Community Choice Aggregators

Timeframe to start implementation:
Medium-term



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

Increase economic feasibility of independent charging/fueling hubs by sharing charging among multiple fleets domiciled or operating in the same neighborhood/logistics hub. Work regionally to identify and engage with fleets that operate regionally but may frequently stop/fuel in specific neighborhoods to inform this effort.

Proposed Lead Implementer:
Regional agency

Proposed Supporting Implementers:
MTC, Community Choice Aggregators, counties, SCTCA, local governments, ports, private fleets

Timeframe to start implementation:
Medium-term



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

Provide technical design guidance to fleets, especially private fleets, to ensure charging infrastructure build out matches the fleets needs more closely to prevent overbuilding, keeping costs of electrification down and avoiding unnecessary service infrastructure upgrades that would result in increased costs for rate payers.

Proposed Lead Implementer:
Regional agency

Proposed Supporting Implementers:
Community Choice Aggregators, SCTCA, state agencies

Timeframe to start implementation:
Medium-term





Measure T-3: Accelerate Decarbonization of Goods Movement

GHG reductions in 2045:
Low *(see Figure 6-2 for an illustration of the GHG emission reductions enabled by these measures and actions and Appendix C for quantified reductions)*

Potential regional benefits:
+ Reduced exposure to air pollution
+ Health benefits

Design principles:

Climate resilience benefits:
A more resilient transportation system less vulnerable to disruptions in fuel supply chains

Estimated costs of implementation:
$$$

Proposed metrics:
Number of pilots deployed, development, and dissemination of policy for warehouses

SUMMARY

Pilot and implement policies that accelerate decarbonization of goods movement and deliveries of goods and reduce emissions that result from increased e-commerce.

This measure helps to ensure that medium- and heavy-duty vehicles continue to electrify given that the state has withdrawn the request for a federal waiver and authorization of the Advanced Clean Fleets rule. This measure is aimed at requiring EVs for last mile delivery as well as at warehouses to continue to expand the use of EV medium- and heavy-duty vehicles and equipment.

Milestones for Initiation:

Initiation dates assume funding and staff resources are available and obtained. If not, shifting initiation dates may be necessary.

- **Q3 2026 –** Develop pilot projects with local governments to pilot ZE delivery zones and/or ZE loading zones
- **Recently initiated –** Begin rule development process for an indirect source rule for warehouses and/or policy guidance for local governments

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Public and Community Health

✚ Reduced exposure to health-damaging pollution from fossil fuel powered vehicle tailpipe emissions

✚ Noise reduction in neighborhoods where diesel trucks and equipment operate

✖ *Does not reduce exposure to other vehicle-related emissions, e.g., brake and tire wear and road dust, which are already occurring with current vehicles*

✖ *Potential air quality impacts from additional brake and tire wear or road dust if charging/fueling hubs are located in frontline communities*

Jobs and Workforce Development

✚ Employment opportunities from building and maintaining micro-hubs, ZE delivery infrastructure, and supporting new delivery technologies

✖ *Risk for warehouse and truck drivers if jobs shift from diesel fleets to electrified fleets without work force transition and retraining support*

✖ *Employment opportunities could be challenging for low-income and disadvantaged jobseekers to secure without the necessary training for this new market*

Costs Burden

✚ Lower cost to energize transportation compared to fueling

✖ *High electricity rates can reduce savings achieved*

ACTIONS

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

Actions may include:

- **Piloting ZE delivery zones and/or ZE loading zones** in frontline communities and urban centers to facilitate and promote the use of ZE delivery trucks or e-cargo bikes for last-mile delivery of goods;
- **Piloting urban micro-hubs** to encourage last-mile ZE deliveries with ZE vehicles or e-cargo bikes (a micro-hub is a small-scale, strategically located facility equipped with basic storage facilities and loading docks that act as an intermediary point for the consolidation and distribution of goods);
- **Developing and disseminating best practices and technical assistance** that is informed by pilots to increase deployment of urban distribution centers and ZE delivery zones more broadly.

Proposed Lead Implementer:
Regional agency, local governments

Proposed Supporting Implementers:
Air District, SCTCA, counties

Timeframe to start implementation:
Medium-term

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

Actions may include:

- **[Non-regulatory] developing and disseminating model policies** for local governments that require the use of ZE trucks and ZE off-road mobile operations at new or expanded warehouses;
- **[Regulatory] investigating the feasibility of a Bay Area indirect source (magnet source)** rule similar to the South Coast Air Quality Management District's Warehouse Actions and Investment to Reduce Emission (WAIRE) Rule Program to address NO_x and diesel particulate matter from warehouses. The rule concept is a phased approach that incorporates a WAIRE style rule along with robust reporting requirements that will support future refinements and a more targeted disparity-reduction strategy.[11]

Proposed Lead Implementer:
Air District

Proposed Supporting Implementers:
Local governments, SCTCA, warehouse operators, private fleets

Timeframe to start implementation:
Medium-term



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

GHG reductions in 2045:
Supporting *(See MTC-ABAG Plan Bay Area 2050+ for GHG reductions from the plan)*

Potential regional benefits:

+ Reduced exposure to air pollution
+ Health benefits
+ Bike/ped safety improvements
+ Increased access to multiple transportation options
+ Improved signage and wayfinding

Design principles:

Climate resilience benefits: Urban greening along pedestrian, bike, and transit infrastructure can help shade surfaces and reduce travelers' discomfort and risk of heat illness during periods of extreme heat. It can also reduce risk to infrastructure of flooding during heavy rains. Expanded public transit options can increase accessibility to critical infrastructure during or ahead of climate events like extreme heat waves.

Estimated costs of implementation:
See MTC-ABAG Plan Bay Area 2050+

Proposed metrics: VMT reductions, change in transit ridership, change in bike/pedestrian activity

SUMMARY

Reduce per-capita GHG emissions from passenger vehicles through supporting implementation of the land use, transit, bike, and pedestrian strategies included in Plan Bay Area 2050+.

This measure supports implementation of Plan Bay Area 2050+ and helps to enable a shift from passenger vehicle travel to trips being made using transit, biking, and walking, reducing VMT and therefore emissions from vehicles. This is done through reducing transportations costs, improving first-mile, last-mile connections to transit, creating a seamless transit experience across different transit agencies in the BARCAP region, etc.

Milestones for Initiation:

Initiation dates assume funding and staff resources are available and obtained. If not, shifting initiation dates may be necessary.

- **Q1 2026 –** MTC-ABAG adopt Plan Bay Area 2050+
- **Q2 2026 –** Begin Implementation of Plan Bay Area 2050+

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Public and Community Health

- ✚ Reduced exposure to health-damaging pollution from fossil fuel powered vehicle tailpipe emissions
- ✚ Accessible and safe active transportation (biking and walking) options encourage people to exercise as part of their day
- ✚ Road safety improvements reduce fatalities and severe injuries due to collisions

Increased Transportation Access

- ✚ Increased mobility options and connectivity results in increased use of transportation alternatives
- ✚ Public transportation and active transportation offer a more affordable mode of transport
- ✖ *Increased safety risks due to more cyclists on roadways*
- ✖ *Uncertainty of funding for public transportation could result in transit service uncertainty*

Jobs and Workforce Development

- ✚ Potential to produce and sustain high roads jobs and improve access to employment opportunities
- ✖ *Employment opportunities could be challenging for low-income and disadvantaged jobseekers to secure without the necessary training for this new market*

Community Engagement, Awareness, and Capacity

- ✚ A community-informed approach can build awareness of transit upgrades and interest in transit options
- ✚ Transit, bike, and pedestrian accessibility and safety upgrades can help meet community needs
- ✖ *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*

Climate Resilience Co-Benefits

- ✚ Urban greening along pedestrian, bicycle, and transit infrastructure can help shade surfaces and reduce travelers' discomfort and risk of heat illness during periods of extreme heat
- ✚ Nature based solutions can reduce the risk of infrastructure flooding during heavy rains
- ✖ *Higher water usage to maintain new plants and trees*
- ✖ *Invasive species or species that are not right for the location could be planted*

Housing Quality and Security

- ✖ *Potential for transit-induced gentrification that could lead to displacement*

ACTIONS

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

Support the implementation of policies and projects that promote multimodal transportation options, while enhancing urban design and connectivity across communities. Advance land use changes consistent with the Transit-Oriented Communities (TOC) policy, active transportation initiatives, and transportation demand management (TDM) efforts.

Actions may include:

- **Implement and monitor the Transit-Oriented Communities (TOC) policy** to foster transit-supportive development and high-quality urban design;
- **Advance Complete Streets implementation** to ensure safe and comfortable travel for people biking, walking, rolling, driving and taking transit, including peer exchanges and workshops on best practices for roadway safety, data management, enforcement, street design, and equity-driven strategies;
- **Design active transportation projects** that accommodate all ages and abilities and close network gaps.
- **Integrate multimodal projects into local plans** and deliver projects that improve experience and connectivity for people biking, walking, rolling, and taking transit.
- **Assess and optimize transportation demand management (TDM) initiatives** based on recent travel trends.

Proposed Lead Implementer:
MTC

Proposed Supporting Implementers:
Air District, cities, counties, county transit agencies, SCTCA, regional organizations

Timeframe to start implementation:
Medium-term



6.6 FUNDING IMPLEMENTATION

Implementation of the transportation sector measures can be supported in part through existing funding and financing approaches. For example, the CEC's California Electric Vehicle Infrastructure Project 2.0 and Communities in Charge programs provide incentives for purchasing and installing light-duty EV charging stations that are available to the public, with prioritization for projects in disadvantaged communities and at multifamily housing. Additionally, the Bay Area Air District administers the Carl Moyer Program, which supports the transition of heavy-duty diesel fleets to ZE and funds the ZE infrastructure to support those vehicles, and the Transportation Fund for Clean Air which funds projects that reduce on-road motor vehicle emissions. The Air District's Clean Cars for All program also provides incentives to replace old vehicles with ZEVs, EVs, or public transit. Furthermore, the CEC's Energize Commercial Vehicles' Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles Project Transit Set Aside program provides funding for medium- and heavy-duty electric vehicle charging infrastructure. The programs listed above are not a comprehensive list of available funding. See Appendix G for other funding and financing sources, programs and partners, and examples of successful implementation. Additional funding and financing mechanisms will be needed to fully achieve the goals of this sector.

ENDNOTES

1 "Zero Emission Vehicle and Infrastructure Statistics Collection," California Energy Commission, Accessed July 15, 2025, https://www.energy.ca.gov/zevstats; Data includes all of Sonoma County and Solano County.

2 Includes battery electric, plug-in hybrid, and fuel cell electric light-duty vehicles, "Zero Emission Vehicle and Infrastructure Statistics Collection," California Energy Commission.

3 "Monthly Transportation Statistics," MTC-ABAG, Accessed September 11, 2025, https://mtc.ca.gov/tools-resources/data-tools/monthly-transportation-statistics.

4 In April 2020, the Metropolitan Transportation Commission (MTC) established the Blue Ribbon Transit Recovery Task Force to help transit agencies rebound from suppressed ridership in the wake of the COVID-19 pandemic.

5 "CARB 2022 Scoping Plan for Achieving Carbon Neutrality," California Air Resources Board, December 2022, https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf.

6 "Plan Bay Area 2050+" MTC-ABAG, Accessed September 15, 2025, https://planbayarea.org/.

7 Plan Bay Area 2050+ defines frequent transit as any of the following: (1) a rail or bus rapid transit station; (2) a ferry terminal served by either bus or rail transit service; or (3) a bus stop served by a route with a headway of 15 minutes or less during the a.m. peak (6-10 a.m.) and p.m. peak (3-7 p.m.) periods.

8 "Assembly Bill 2127 Second Electric Vehicle Charging Infrastructure Assessment: Assessing Chargin Needs to Support Zero-Emission Vehicles in 2030 and 2035," California Energy Commission, Accessed December 4, 2025, https://www.energy.ca.gov/publications/2024/assembly-bill-2127-second-electric-vehicle-charging-infrastructure-assessment; "2017 Bay Area Clean Air Plan," Bay Area Air District, 2017, https://www.baaqmd.gov/~/media/files/planning-and-research/plans/2017-clean-air-plan/attachment-a_-proposed-final-cap-vol-1-pdf.pdf.

9 More information can be found in the Appendix E.

10 "Contra Costa County Climate Action and Adaptation Plan 2024 Update," Contra Costa County, November 5, 2024, https://www.contracosta.ca.gov/DocumentCenter/View/84967/Contra-Costa-County-2024-Climate-Action-and-Adaptation-Plan-PDF?bidId=.

11 The WAIRE Program is an indirect source rule that regulates warehouse facilities to reduce emissions from the goods movement industry. For more information: https://www.aqmd.gov/home/rules-compliance/compliance/waire-program.

Gentrification and housing affordability

The Bay Area's housing and affordability challenges are well-known, persistent, and deeply entrenched. There is a high percentage of renters (~40%) in the region who face some of the most expensive rents in the nation, with nearly half considered to be "rent-burdened" (i.e. spend more than 30% of monthly income on rent). Multiple factors intertwining over the past decades have led to housing insecurity and lack of affordable housing in the Bay Area today. Recent plans and policies such as those found in Plan Bay Area 2050, Assembly Bill 1482 (2019), newly mandated regional housing production targets established by the State of California, and the recent passage of California Environment Quality Act (CEQA) reform legislation (intended to remove barriers to creating new housing) reflect the growing sense of urgency to address these challenges, but more action is needed.[1]

Efforts to reduce greenhouse gas (GHG) emissions from the built environment largely depend on physical and social changes, which themselves result in benefits that improve communities and quality-of-life. For example, energy efficiency reduces emissions by cutting energy consumption, increases comfort and lowers utility bills, saving money in the long term. However, if implemented without thoughtful consideration, planning, and engaging with affected communities, actions to reduce GHGs could result in unintended consequences. For instance, upgrading housing units with new, efficient appliances and equipment could result in rent increases and evictions due to gentrification and displacement.

Minimizing potential unintended consequences for the large population of renters in the Bay Area requires intentional and thoughtful implementation of GHG reduction strategies. For example, landlords installing zero-NO_x appliances could be incentivized or compelled by local authorities to minimize passing through the costs for upgrades to tenants.[2] The same would go for other upgrades like rooftop solar and battery storage and adding electric vehicle charging. Similarly, financial incentive programs that lower costs for building owners could include provisions that establish protections for existing tenants (e.g., provision of temporary relocation assistance and "right to return" policies after work is completed).



ENDNOTES

1 "Plan Bay Area 2050+" MTC-ABAG, Accessed November 18, 2025, https://planbayarea.org/plan-bay-area-2050-plus; California Congress, House, Tenant Protection Act of 2019: tenancy: rent caps, AB-1482, Approved by Governor October 8, 2019, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB1482; "California's Housing Future 2040, The Next Regional Housing Needs Allocation (RHNA)," California Department of Housing and Community Development, April 2024, https://www.hcd.ca.gov/sites/default/files/docs/planning-and-community/rhna/cahf-2040-rhna-report-2024.pdf; "Governor Newsom signs into law groundbreaking reforms to build more housing, boost affordability," Governor Gavin Newsom, June 30, 2025, https://www.gov.ca.gov/2025/06/30/governor-newsom-signs-into-law-groundbreaking-reforms-to-build-more-housing-affordability/.

2 For a recent and comprehensive analysis of the Bay Area's complex landscape of local renter protection laws, how they interact with state laws, and the challenges related to their implementation as well as recommendations to mitigate risks, please see this "Renter Protections Policy Landscape Summary" report, which was completed in 2024 as part of the Zero-NO_x Building Appliance Rule Implementation Working Group.

7 Building Sector

7.1 Vision for 2045

7.2 Sector overview

7.3 Context

7.4 How proposed measures were developed

7.5 Building sector measures and actions

7.6 Funding implementation





7 Building Sector

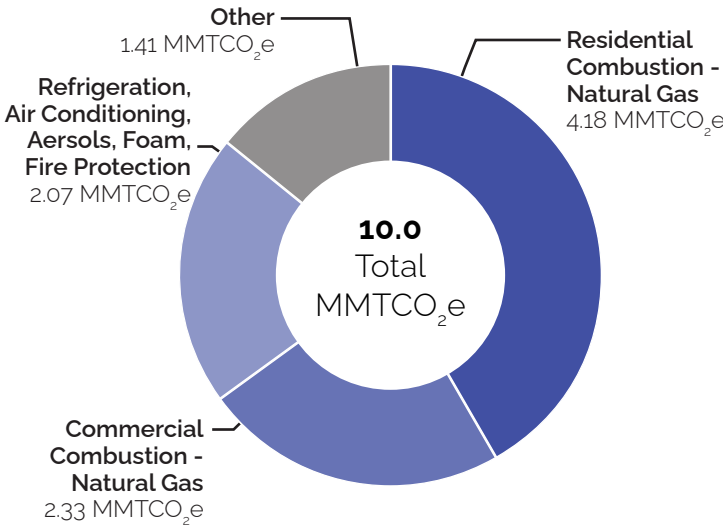
7.1 VISION FOR 2045

In 2045, there are healthy, zero emission homes for all through the equitable implementation of existing regulations, integrated programs to reduce emissions while improving housing conditions for those most in need, and a successful, well-trained, and diverse workforce to serve the entire community.

7.2 SECTOR OVERVIEW

The building sector includes homes, commercial businesses, office spaces, places of worship, entertainment venues, etc. Greenhouse gas (GHG) emissions in this sector primarily result from the direct combustion of natural gas for space and water heating, clothes drying, and cooking, as well as leaks of refrigerants from building equipment such as air conditioning and refrigeration units, and leaks from the natural gas distribution system. Although the GHG inventory for this sector includes lawn and garden equipment, airport ground support equipment, and off-road recreation vehicles, they together account for under 4% of sector-level emissions and are not explicitly addressed in the Bay Area Regional Climate Action Plan (BARCAP).

Figure 7-1: GHG emissions by buildings sub-sector for BARCAP region in 2022



Total emissions from the building sector (as defined above) were 10.0 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) in 2022 (or 18% of regional GHG emissions), as shown in Figure 7-1. Combustion of natural gas in residential and commercial buildings are the largest contributors, accounting for approximately 42% and 23% of total emissions from the sector, respectively. GHG emissions from this sector increased by 15% (1.14 $MMTCO_2e$) between 1990 and 2022 within the BARCAP region.

California buildings constructed over the past century – including most Bay Area homes – mainly rely on natural gas for space and water heating, which together comprise the vast majority of the building sector's GHG emissions. Therefore, for the BARCAP, the building sector focuses on the GHG emissions generated by the combustion of fossil fuels from space heating, water heating, cooking, and clothes washing and drying, primarily in residential buildings. As the state's supply of renewable electricity continues to increase toward a goal of 100% by 2045, a larger share of remaining building emissions will be attributable to natural gas usage. Switching natural gas burning appliances to clean, efficient, electric alternatives like heat pumps is commonly referred to as building decarbonization or building electrification.

State and local governments in the Bay Area have made considerable progress towards building decarbonization (as described in the paragraph above) over the past decade. Successful approaches include developing and implementing local building codes that go beyond state requirements to advance building decarbonization, funding and operating innovative heat pump incentive programs (such as the "Technology and Equipment for Clean Heating" or "TECH Clean California" program), and delivering effective public outreach education about the multiple benefits of electric appliances. New regulatory efforts, such as the Air District's zero nitrogen oxides (NO_x) building appliance rules (further described below), are currently expected to significantly reduce GHG emissions from natural gas combustion in the residential sector. Still much more needs to be done in the building sector to help achieve state and local climate goals.



7.3 CONTEXT



At the state level, the California Air Resources Board's 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan) scenario for the building sector reflects the following policy goals established by Governor Newsom.[1]

- ***Install six million heat pumps by 2030*** (water and space heating);
- ***Deliver three million "climate ready" (all-electric and electric-ready) homes with heat pumps by 2030*** (seven million by 2035);
- ***Direct 50% of state climate funding*** to low-income and disadvantaged communities.

In 2023, the Bay Area Air District adopted amendments to Rules 9-4 and 9-6 ("appliance rules") which phase in requirements to reduce nitrogen oxides (or "NO_x," which worsens air quality and harms public health when released to the atmosphere) from space and water heating appliances.[2] While these rule amendments establish limits on air pollutants to protect public health, they are also expected to dramatically reduce GHG emissions by displacing natural gas with electricity. While the rules do not require the use of electric equipment, it is expected that most property owners will choose efficient electric heat pump technologies to meet the regulatory requirements. If everyone chooses electric appliances, at full implementation (i.e., when all NO_x-emitting appliances covered by the rules have been replaced with zero-NO_x options), the appliance rules could reduce residential and commercial building natural gas combustion emissions by approximately 70% below 2022 levels.

Also, as noted earlier, local governments play a vital role in piloting bold and innovative policies, programs, and partnerships that can establish new models and best practices for others to learn from and adopt widely. While Assembly Bill 130 (passed in 2025) will impede the development of local residential reach codes until 2031, cities and counties will continue to seek other ways to advance equitable and impactful building decarbonization.[3]

It is important to note that energy efficiency, which has been a staple of state and local efforts to reduce building sector emissions over the past several decades, is currently being addressed by programs administered by the Bay Area Regional Energy Network (BayREN). So, while not explicitly its own measure, the BARCAP acknowledges energy efficiency as a critical tool to achieve building sector goals and takes a strategic and targeted approach to driving its benefits to traditionally underserved Bay Area populations (see measure B-2 and supporting actions).

Based on feedback from public engagement conducted during the development of the BARCAP, there is strong regional support for transitioning buildings from gas to all-electric (public survey results ranked this fifth out of 13 potential focus areas for climate action). That said, members of the BARCAP region's frontline communities who participated in the BARCAP engagement process expressed concerns about how renters would be financially impacted by implementation of the appliance rules and perceived challenges with finding skilled contractors for zero-NO_x appliances. They also expressed support for a simplified permit process for zero-NO_x appliances, increasing the availability of multilingual contractor training, and expanding efforts to combine health and safety retrofits with electrification and energy efficiency upgrades.

El Concilio of San Mateo County

El Concilio is a non-profit, community-based organization committed to increasing education, employment, and access to quality-of-life services for underserved communities in San Mateo County, which experiences deep social and racial inequities despite being one of the richest counties in the country. While climate action programs are easily accessible to many in the county, El Concilio aims to close the gap for low-income and non-English speaking households who face financial and language barriers. El Concilio recently partnered with Peninsula Clean Energy (PCE) to provide multilingual outreach to promote programs aimed at helping people save energy, money and reduce emissions such as their Green Access Program. By partnering with trusted community organizations like El Concilio, PCE can better serve households in frontline communities and equitably distribute resources and benefits. El Concilio delivers written, oral, and in-person workshops entirely in Spanish, ensuring that target audiences get the information in a way they can use.

The Bay Area is rich with community organizations that are deeply trusted and well-positioned to partner with government agencies so that more people across the spectrum can participate in important and beneficial climate initiatives.

Because buildings and homes play a direct role in the daily lives of communities everywhere, equity must be a central consideration when developing and implementing building decarbonization programs and policies. Key issues include protecting low-income owners and renters from economic hardship, housing insecurity, and displacement risks; supporting workforce readiness and increasing employment opportunities for disadvantaged workers; ensuring that financial incentives are directed to those most in need; and prioritizing culturally appropriate communications and inclusive stakeholder engagement so that marginalized communities are not left behind in the transition to healthy, low emission buildings. Any and all measures aimed at reducing building emissions must include implementation mechanisms that do not exacerbate housing displacement.



The BARCAP focuses addressing key challenges with implementing regional zero-NO_x appliance rules; supporting low-income households by integrating home repair, energy efficiency and weatherization services with building decarbonization incentives; and growing the building decarbonization workforce by connecting employers with diverse and well-trained personnel.

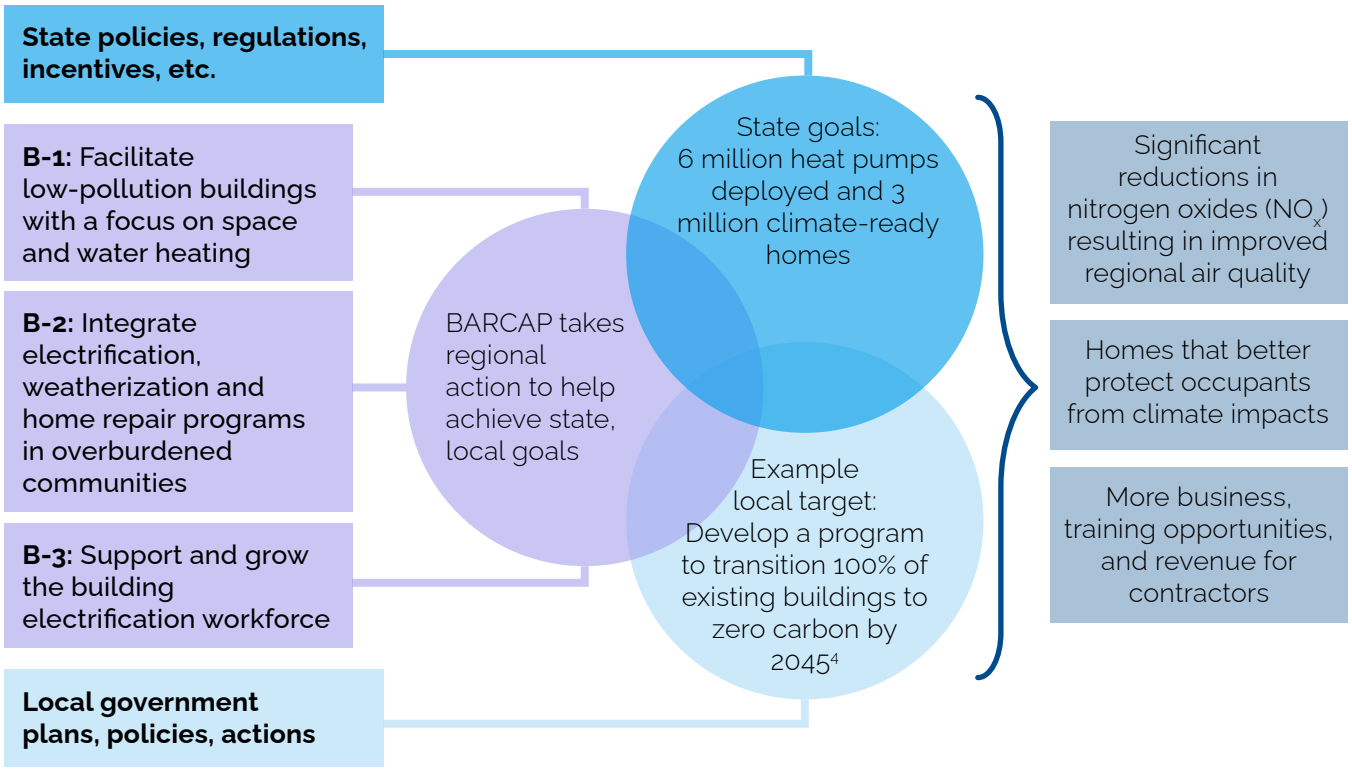
7.4 HOW PROPOSED MEASURES WERE DEVELOPED

As described in Chapter 4 on Engagement, measures and actions for the building sector were developed with extensive input from the public, frontline community members, Advisory Work Group members, and members of a technical working group. The technical working group was comprised of 17 subject matter experts representing local governments, Community Choice Aggregators, incentive program administrators, affordable housing providers, workforce specialists, and others knowledgeable about the opportunities and challenges of the sector. These experts grounded measures in the current implementation landscape (including key hurdles and areas for action) and helped develop and refine the proposed measures and actions in collaborative meetings over a six-month period. See Chapter 4 for an overview of BARCAP's sector-level technical working groups.

The measures described on the following page can be activated with implementing partners' existing authorities.

7.5 BUILDING SECTOR MEASURES AND ACTIONS

Figure 7-2: Building measures contributing to state and local goals



The measures and actions for the building sector contribute to achieving state and local goals for the sector and result in many other key benefits. As shown in Figure 7-2, they complement, rather than duplicate, state and local actions in important ways. The measures and actions support successful local implementation of state policies and initiatives in ways that are equitable and bring benefits to the BARCAP region. They also help remove barriers and build capacity to accelerate local action and scale promising approaches regionally.



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

GHG reductions in 2045:
Low *(see Figure 7-2 for an illustration of the GHG emission reductions enabled by these measures and actions and Appendix C for quantified reductions)*

Potential regional benefits:
- \+ Reduced exposure to air pollution
- \+ Climate resilience
- \+ Job creation
- \+ Reduced energy costs
- \+ Improved housing quality
- \+ Enhanced community engagement

Design principles:

Climate resilience co-benefits:
The transition to zero-NO_x appliances will provide air conditioning in addition to space heating which can protect communities from extreme heat.

Estimated costs of implementation:
$$$

Proposed metrics: Number of new outreach activities and/or information resources provided (including how the information was delivered), particularly in or for overburdened communities. Examples include tabling at events, sending online communications, or presenting at industry gatherings about appliance rules and/or sharing resources regarding supportive strategies e.g., low-power appliance options, permit streamlining approaches. Number of jurisdictions adopting the model code or streamlined permitting for zero-NO_x appliances.

SUMMARY

Support an equitable and affordable transition to healthy, zero-NO_x water and space heating for buildings in the BARCAP region by addressing key implementation challenges of the Air District's appliance rules, which go into effect for small gas residential water heaters in 2027 and gas furnaces in 2029. Actions are informed by the Air District's Implementation Working Group in addition to BARCAP stakeholder engagement.

This measure addresses key challenges such as increasing awareness of the rules among contractors and building owners by creating innovative partnerships and solutions to help realize the important air quality, health, and climate benefits of the appliance rules.

Milestones for Initiation:

- ★ **Q2-Q3 2026 –** Solidify key partnerships, secure commitments and develop work plans for key actions, including supply chain collaboration and increased engagement with affordable housing providers
- ★ **Q3 2026 –** Work with key partners to conduct outreach to local governments about permit streamlining best practices
- ★ **Q4 2026 –** Launch broad public awareness campaign about zero-NO_x appliance rules, including DIY-installation best practices
- ★ **Q1 2027 –** Work with partners to pilot small form factor heat pump water heaters (HPWHs)

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Housing Quality and Security

✚ Improved housing conditions and increased comfort

✖ *Increased housing costs due to cost of appliance installation*

Public and Community Health

✚ Reduced exposure to health-damaging indoor and outdoor air pollution

✖ *Limited funding and financing could reduce benefits to low-income building owners and tenants*

Jobs and Workforce Development

✚ More employment opportunities in zero-NO_x appliance installation

✖ *Reduced work in gas appliance installation*

Community Engagement, Awareness, and Capacity

✚ Increased awareness and engagement in solutions builds 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*

Climate Resilience Co-benefits

✚ Reduced exposure to wildfire smoke and extreme heat contributes to improved health outcomes

✖ *Lack of engagement and financial support for low-income and disadvantaged communities excludes them from cooling and air filtration benefits*

Cost Burden

✚ Decreased energy cost burden from more efficient appliances

✖ *High electricity rates can reduce savings achieved*

ACTIONS

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

Example activities could include:

- **Coordinate and deliver consistent outreach and marketing campaigns** through distribution networks regarding zero-NO_x appliance benefits, products, and services;
- **Promote aligned/consistent contractor training and sales tools** (aligns with and supports Measure B-3);
- **Support the provision of non-equipment retrofit materials at distribution centers** such as duct kits/terminations, insulated flex duct, grilles, louvered doors, enclosures, etc.;
- **Collect and share data regarding contractor installations** (models, Unified Energy Factor (UEF) ratings, voltage, etc.) to help distributors fine-tune inventory stocking to best match local housing stock and to inform incentive program design.

Proposed Lead Implementer:
Air District

Proposed Supporting Implementers:
CA Heat Pump Partnership (CAHPP), Energy Solutions' Trade Ally Management Program

Timeframe to start implementation:
Short-term

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

Coordinate local development and implementation of supportive policies with regional partners such as BayREN and Community Choice Aggregators. Collect and disseminate model code language to support local code updates that focus on preparing buildings for future electric appliances.

Proposed Lead Implementer:
Air District

Proposed Supporting Implementers:
BayREN, Community Choice Aggregators, SPUR, Sonoma County Transportation and Climate Authorities (SCTCA) and other local governments

Timeframe to start implementation:
Short-term

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

Reduce upfront costs for zero-NO_x appliance replacements by helping avoid expensive panel upgrades by propagating the knowledge and use of low power appliance options like 120 Volt heat pump water heaters (HPWH) and panel optimization strategies (e.g., circuit splitters and/or smart electric panels which can balance home electric loads in real-time to make the most of existing service capacity). Collaborate with key partners to spread knowledge and best practices to a range of key audiences.

Proposed Lead Implementer:
Air District

Proposed Supporting Implementers:
CAHPP, SPUR, POWER group, Community Choice Aggregators, utilities, community organizations

Timeframe to start implementation:
Short-term

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

Seek out new capital sources and mechanisms, including easy-to-use financing options with strong consumer protections, which solve upfront cost barriers.

Proposed Lead Implementer:
Air District

Proposed Supporting Implementers:
Community Choice Aggregators, BayREN, State of California, specialty lenders

Timeframe to start implementation:
Short-term

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

Develop an awareness-building communications campaign to ensure stakeholders in the Bay Area know about the upcoming compliance dates for the zero-NO_x appliance rules. Partner with key organizations and community partners to leverage their networks and ensure a wide reach.

Proposed Lead Implementer:
Air District

Proposed Supporting Implementers:
BayREN, local governments, Community Choice Aggregators, Building Decarbonization Coalition, CAHPP, community organizations

Timeframe to start implementation:
Short-term

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[5]

Work with key agencies and other partners to engage closely with affordable housing owners to increase shared understanding of opportunities and constraints regarding the transition to healthy zero-NO_x appliances.

Proposed Lead Implementer:
Air District

Proposed Supporting Implementers:
BayREN, local governments, affordable housing providers, community-based organizations who serve residents in affordable housing

Timeframe to start implementation:
Short-term

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)

Provide helpful guidance that promotes safe and correctly done installations by homeowners who have the technical ability and motivation to install their own zero-NO_x appliance, to increase the likelihood that units perform as intended.

Proposed Lead Implementer:
Air District

Proposed Supporting Implementers:
SCTCA and other local governments, Community Choice Aggregators, community-based organizations

Timeframe to start implementation:
Short-term

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

Collaborate with key partners in the BARCAP region to support market adoption of new small form-factor HPWH designs through pilot projects, performance reporting, and outreach and education activities to share lessons learned.

Proposed Lead Implementer:
Air District

Proposed Supporting Implementers:
Community Choice Aggregators, TECH Clean CA, building owners

Timeframe to start implementation:
Short-term



Measure 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

GHG reductions in 2045:

Low *(see Figure 7-2 for an illustration of the GHG emission reductions enabled by these measures and actions and Appendix C for quantified reductions)*

Potential regional benefits:

+ Reduced exposure to air pollution
+ Climate resilience
+ Reduced energy costs
+ Improved housing quality and comfort
+ Enhanced community engagement

Design principles:

Climate resilience co-benefits: Weatherized and insulated homes provide better protection from extreme heat and cold. Highly efficient electric heat pumps provide air conditioning in addition to space heating. Homes that address needed repairs and deferred maintenance are safer and healthier for occupants.

Estimated costs of implementation: $

Proposed metrics: Number of homes receiving remediation and energy efficiency upgrades, number of homes electrified and receiving solar power.

SUMMARY

Perform holistic building retrofits that include energy efficiency, electrification, and home repair and remediation by braiding together and augmenting funding, services, and other assistance from existing programs. Focus retrofits in the BARCAP region's low-income and frontline communities. This measure builds upon the Air District's Bay Area Healthy Homes Initiative, and the initial buildings-focused program concept first articulated in the Priority Climate Action Plan (called the "Bay Area Clean Homes Initiative," or "BACHI").[6] The implementation of this measure is highly dependent on seeking and obtaining other funding sources (per B-2.1). BayREN and the Air District are committed to leading this exploration in partnership with other key organizations as noted below.

This measure addresses the need for many building owners to address non-energy compliance and other issues before being able to take advantage of assistance and incentives for energy upgrades. By augmenting and leveraging existing resources with new partnerships and approaches, this measure will help address multiple critical challenges facing Bay Area frontline communities.

Milestones for Initiation:

- **Q2 2026 –** Explore relevant funding and partnership opportunities to support the implementation of all measures
- **Q1 – Q2 2026 –** Work with the California Public Utilities Commission (CPUC), Pacific Gas & Electric Company (PG&E) and county governments to inform the design of voluntary pilot programs for priority neighborhood decarbonization zones
- **Q3 – Q4 2026 –** Work with Rebuilding Together and other partners to design a partnership and funding structure for a pilot program that integrates energy efficiency and remediation
- **Q1 2027 –** Initiate the pilot program and begin to document lessons learned to inform future expansion

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Housing Quality and Security

✚ Improved housing conditions and increased comfort; deferred maintenance remediation

✖ *Increased housing costs due to cost of building retrofits and electrification*

Public and Community Health

✚ Reduced exposure to health-damaging air pollution

Jobs and Workforce Development

✚ More employment and training opportunities in building retrofitting and electrification for frontline communities

Community Engagement, Awareness, and Capacity

✚ Increased awareness and engagement in solutions builds 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*

Climate Resilience Co-benefits

✚ Improved home insulation, ventilation and filtration systems reduce wildfire smoke and extreme heat or cold impacts

Cost Burden

✚ Decreased energy cost burden from more efficient appliances and better insulation

✖ *High electricity rates can reduce savings achieved; inaccessibility or inability to leverage incentive programs or cost-saving initiatives*

ACTIONS

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

Identify new, additive financial resources to support the planning, integration, and execution of integrating existing programs that will lead to positive health and climate outcomes and improved housing conditions for frontline communities.

Proposed Lead Implementer:
BayREN

Proposed Supporting Implementers:
Air District, Community Choice Aggregators, PG&E

Timeframe to start implementation:
Short-term/Ongoing



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

Braid together existing resources (funding, technical assistance, outreach) to ensure the benefits of building decarbonization are made available to those with the fewest means to participate and who can benefit the most.

Proposed Lead Implementer:
BayREN

Proposed Supporting Implementers:
Community Choice Aggregators, Air District, PG&E, and municipal electric utilities

Timeframe to start implementation:
Short-term/Ongoing



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

Advance early-stage planning efforts to pilot targeted neighborhood-scale natural gas distribution system decommissioning that can scale-up building electrification and offset future investments in GHG-and-capital intensive gas infrastructure.

Proposed Lead Implementer:
BayREN, PG&E

Proposed Supporting Implementers:
SCTCA and other local governments

Timeframe to start implementation:
Short-term



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

Work with Rebuilding Together and Habitat for Humanity to leverage programmatic resources (funding, technical assistance, outreach) to implement holistic home retrofits for low-income and frontline communities within two to three counties.

Proposed Lead Implementer:
BayREN, Rebuilding Together

Proposed Supporting Implementers:
Habitat for Humanity Bay Area, Association for Energy Affordability (AEA), SCTCA and other local governments, Community Choice Aggregators, PG&E

Timeframe to start implementation:
Medium-term



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

Use lessons learned from initial pilot experiences (from B-2.4) to adjust and expand efforts to additional Bay Area counties with an added emphasis to work with and support distinct types of affordable housing sites (deed-restricted and naturally occurring).

Proposed Lead Implementer:
BayREN, Rebuilding Together

Proposed Supporting Implementers:
Affordable housing owners, Habitat for Humanity Bay Area, and Association for Energy Affordability (AEA), SCTCA and other local governments, Community Choice Aggregators, PG&E

Timeframe to start implementation:
Long-term





Measure 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

GHG reductions in 2045:
Supporting

Potential regional benefits:

- + Reduced exposure to air pollution
- + Job creation
- + Professional development and employment opportunities
- + Enhanced community engagement
- + More capitol flowing in the local economy

Design principles:

Climate resilience benefits: More local capacity and knowledge of how to install, maintain and service clean and electric zero-NO_x building appliances, which provide resilience benefits such as air conditioning and better air quality. A well-trained workforce that better represents the members of the community can provide improved service, improve compliance, and support the equitable distribution of the benefits of clean electric appliances.

Estimated costs of implementation:
S

Proposed metrics: Number of activities (such as specialized heat pump trainings, peer-to-peer mentorship sessions).

SUMMARY

Support the transition to healthy, emissions-free buildings by ensuring there is a trained and sufficient contractor workforce equipped with the new skills and knowledge required to install efficient, electric heat pumps.

While public funding for incentives has set a foundation for early adopters in the field, the building decarbonization contractor base needs to scale up significantly to effectively implement the zero-NO_x appliance rules and achieve state, regional, and local building decarbonization goals. This is especially important considering the transition from gas to electric appliances and as incumbent workers age-out of the workforce. These actions support this outcome by creating an attractive and sustainable business environment that highlights today's heat pump contractors, increasing their overall numbers, and focusing on building the next generation of workers that reflects the diverse and multilingual communities of the Bay Area.

Milestones for Initiation:

- ★ **Q2 2026 –** Solidify key partnerships, secure commitments, and develop work plans for key actions, including seeking funding for B-3.2 (recruiting incumbent and new minority and women owned contractors to building decarbonization training and professional development opportunities) and collecting data for B-3.4 (regional workforce information sharing network)
- ★ **Q3 2026 –** Begin piloting B-3.1 (promoting well-trained contractors) and B-3.3 (implementing a contractor mentorship program) and refine based on early experiences
- ★ **Q4 2026 –** Formal launch of regional workforce information sharing network

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Jobs and Workforce Development

✚ More employment and training opportunities in building retrofitting and electrification for frontline communities

✖ *Lack of investment in upskilling incumbent workers in new technologies leads to job losses for them*

Community Engagement, Awareness, and Capacity

✚ Increased awareness and engagement in solutions builds trust between communities and the government

✖ *Lack of sufficient engagement and outreach results in reduced trust and disinterest in programs*

Housing Quality and Security

✚ Improved housing quality from more available trained workers deploying projects in their own communities

Public and Community Health

✚ Improved public and community health from more available trained workers deploying projects in their own communities

ACTIONS

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[7]

Provide easy-to-access training that "meets contractors where they are" and focuses on enabling quality installations are key to a successful transition to zero-NO_x appliances. Collaborate with key partners to highlight contractor designations obtained through training programs that promote quality installation practices for consumers.

Proposed Lead Implementer:
State and regional organizations

Proposed Supporting Implementers:
Community Choice Aggregators, Sonoma County Transportation and Climate Authorities and other local governments, community organizations

Timeframe to start implementation:
Short-term

B-3.2: Explore 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

Facilitate collaborations with Bay Area entities that empower minority, women-owned and other disadvantaged companies to increase their opportunities and participation in the growing building decarbonization sector.

Proposed Lead Implementer:
Regional organizations

Proposed Supporting Implementers:
Community Choice Aggregators, local nonprofit workforce training organizations

Timeframe to start implementation:
Short-term

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

Contractors trust other contractors for good industry advice. Develop and implement a "mentorship-style" program that leverages peer-to-peer learning and information sharing that inspires contractors who have been hesitant to shift to heat pumps to engage in training and business opportunities, and include in-language engagement to ensure non-English speaking contractors are included.

Proposed Lead Implementer:
Regional organization

Proposed Supporting Implementers:
TECH Clean CA, CAHPP, Community Choice Aggregators, SCTCA and other local governments

Timeframe to start implementation:
Short-term

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

Collaborate with key partners in the BARCAP region to build out an accessible directory that lays out the regional building decarbonization workforce ecosystem in a way that increases transparency and the ability to access information to aid in hiring, employment, training, and project opportunities.

Proposed Lead Implementer:
Regional organization

Proposed Supporting Implementers:
Training and education providers, industry associations/contractor networks, manufacturers, community organizations

Timeframe to start implementation:
Medium-term



7.6 FUNDING IMPLEMENTATION

Implementation of the building sector measures can be supported in part through existing incentive and financing programs. Most notable is the statewide TECH Clean CA program, which offers direct cash rebates to qualified homeowners for high-efficiency heat pumps.[8] BayREN's EASE Program provides technical assistance and financial incentives for energy efficiency measures that can lower energy bills, improve home comfort, and increase the performance of electric heat pumps.[9] The California Energy Commission's Equitable Building Decarbonization program provides and installs similar projects at no cost to low-income households in under-resourced communities.[10] Regarding financing options, both the GoGreen Multifamily Energy Financing and GoGreen Home Energy Financing programs (both backed by the state treasurer's office) leverage credit enhancements to provide low-interest loans for building owners to install a wide range of energy upgrades, including heat pumps.[11] A number of the Bay Area's Community Choice Aggregators are launching 0% interest loan programs for heat pumps as well. The programs listed above are not a comprehensive list of available funding. See Appendix G for other funding and financing sources, programs and partners, and examples of successful implementation. Additional funding and financing mechanisms will be needed to fully achieve the goals of this sector.

7.7 ENDNOTES

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2 "FAQ ABOUT AIR DISTRICT APPLIANCE RULES," Bay Area Air District, n.d., https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces/2021-amendments/documents/20230522_faq_appliance-rules_final-pdf.pdf?rev=e2d8ff126b8d4e458d611ee5bfe480fb&sc_lang=en; When released to the atmosphere, NO_x reacts with other chemicals in the air to form both fine particulate matter (PM2.5) and ozone (O3), both which contribute significantly to poor air quality and can cause and exacerbate respiratory illnesses such as asthma.

3 California Congress, House, Committee on Budget, Housing, AB-130, Approved by Governor June 30, 2025, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202520260AB130; AB 130, which was added as trailer bill in the California legislature's vote to approve the 2025-25 state budget, included language to freeze certain changes to state and local building codes, including the ability for cities to adopt local "reach codes" for building energy efficiency and decarbonization that go beyond what the state code requires until 2031.

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9 "Efficiency and Sustainable Energy (EASE) Home Program," BayREN, Accessed November 18, 2025, https://www.bayren.org/ease-home.

10 "EBD Statewide Direst Install Program," California Energy Commission, Accessed November 18, 2025, https://www.energy.ca.gov/programs-and-topics/programs/equitable-building-decarbonization-program/ebd-statewide-direct.

11 "Elevate your multifamily property," GoGreen Financing, Accessed November 18, 2025, https://www.gogreenfinancing.com/multifamily/.

8 Power Sector

8.1 Vision for 2045

8.2 Sector overview

8.3 Context

8.4 How proposed measures were developed

8.5 Power sector measures and actions

8.6 Funding implementation





8 Power Sector

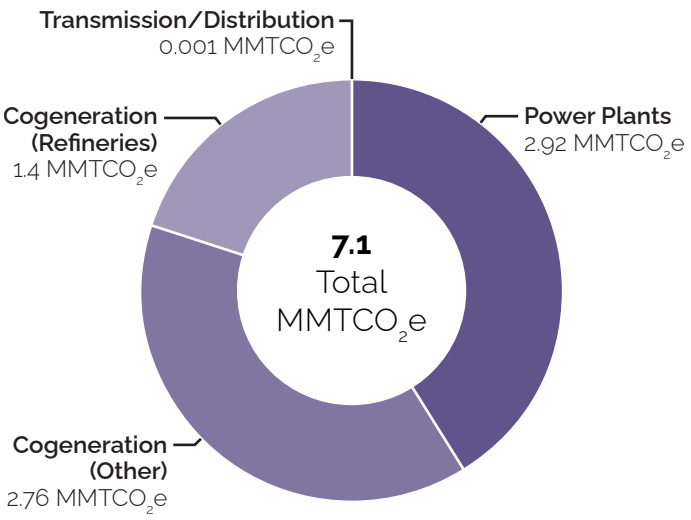
8.1 VISION FOR 2045

In 2045, the electricity produced and consumed in the Bay Area Regional Climate Action Plan (BARCAP) region is 100% clean and affordable for everyone, including frontline communities.[1] The grid is resilient and reliable, able to continuously meet growing electrification needs and support decarbonization in sectors such as buildings and transportation. This is achieved while minimizing rate impacts and in a manner that benefits frontline communities.

8.2 SECTOR OVERVIEW

The power sector includes both the generation and consumption of electricity in the BARCAP region. Because natural gas is the primary fossil fuel used to generate electricity in the BARCAP region, shifting to carbon-free fuels like renewable energy and storage will help reduce greenhouse gas (GHG) emissions for this sector. Shifting electricity demand to periods when renewable energy is abundant can help lessen reliance on polluting fossil fuel-based power plants, reducing GHG emissions even further.[2]

Figure 8-1: GHG emissions by power sub-sector for BARCAP region in 2022



Greenhouse gas emissions from the generation of electricity in the BARCAP region have decreased since 1990, due to requirements under the state Renewables Portfolio Standard that are driving decarbonization of the region's electric power generation mix by increasing the portion of electricity supplied by clean resources. Total emissions from the generation of electricity were 7.1 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) (or 13% of regional GHG emissions) in 2022, as shown in Figure 8-1. These emissions are predominantly from natural gas-fired power plants and cogeneration facilities. (Cogeneration facilities produce electricity on-site and utilize thermal energy, or heat, released during the generation of electricity for other processes.) Approximately 1.4 MMTCO2e of cogeneration emissions (or 2.6% of regional GHG emissions) are from cogeneration at transportation fuel refining facilities (see Figure 9-1). These emissions are associated with the transportation sector when accounting for all transportation-related emissions. Chapter 2.1.3 and Appendix A describe the contribution of emissions from the refining of transportation fuels in more detail.

Some of the electricity consumed in the Bay Area is produced within the region, and some is produced outside the region. The BARCAP inventory focuses on the GHG emissions produced from electricity generated within the BARCAP region and does not include emissions from electricity generated outside the BARCAP region. In this way, the inventory aligns with the state's GHG inventory approach and highlights the impact of local power plants and cogeneration facilities on GHG emissions as well as other air pollutant emissions that impact communities near these facilities (see the co-pollutants analysis in Chapter 5). While the BARCAP inventory focuses on emissions from the generation of electricity in the BARCAP region, it is important to note that state law prohibits local air districts from regulating carbon dioxide (CO2) emissions from sources covered by the state's Cap-and-Invest program, including most of the CO2 emissions from power plants and cogeneration facilities.[3] Therefore the Air District is limited in its ability to directly address these emission sources.



However, the BARCAP region can and is forging ahead by deploying clean energy. In 2022, renewable energy sources in the BARCAP region provided nearly half of the region's total power capacity (or five Gigawatts (GW)).[4] Wind and geothermal provided roughly 27% and 25% of the renewable capacity, respectively, while small-scale solar photovoltaic (PV) supplied 45% and large-scale solar PV resources provided 3%.[5] There were roughly 460 megawatts (MW) of battery storage in the region in 2022 as well.[6] Total renewable energy and storage capacity grew to six GW in 2025.

Electricity providers serving the BARCAP region have ambitious clean energy goals, as shown in Table 8-1, which affect the GHG emissions from electricity consumed in the Bay Area. The BARCAP region is home to five Community Choice Aggregators (CCAs), which purchase electricity on behalf of the residents and businesses in their communities, and two municipal utilities, all of which provide clean electricity at reduced rates. Many local climate action plans include actions to encourage resident and business participation in CCAs and to opt for the 100% renewable power option provided by CCAs. The CCAs, municipal utilities, and the investor-owned utility serving the BARCAP region, Pacific Gas & Electric (PG&E), also provide rebate and incentive programs to support electrification.

Table 8-1: BARCAP region electricity provider clean energy goals

ELECTRICITY PROVIDER	GOAL
Alameda Municipal Power (AMP)	Provide 100% clean energy to all customers (achieved)
Ava Community Energy	Provide 100% carbon-free electricity to all customers by 2030
CleanPowerSF (CPSF) and Hetch Hetchy Power	Provide 100% renewable energy to all customers (achieved)
MCE	Light Green service is 85% renewable energy by 2029 (Deep Green service is 100% renewable energy today)
Peninsula Clean Energy (PCE)	Provide 100% renewable electricity by 2030
PG&E	Net-zero energy system by 2040
Sonoma Clean Power (SCP)	Supply 80% of load with clean resources in winter evenings by 2030

While the BARCAP region has made significant headway, more action is needed to meet state and local clean energy goals. The BARCAP measures focus on helping meet state and local clean energy goals by addressing challenges to deploying small- to medium-scale clean energy (including behind-the-meter) in ways that benefit the BARCAP region, and particularly frontline communities, including increased resilience and access to local clean energy and potential affordability and job creation benefits. The measures also focus on creating a more flexible, efficient, and resilient grid with clean backup power, which can provide cost savings opportunities and help lessen reliance on fossil-fuel-based power plants to meet peak energy demands.



8.3 CONTEXT

The California Air Resources Board's 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan) projects electricity demand will increase 76% from 2022 levels in 2045. (This includes projected electricity needs for building and vehicle electrification efforts, which the state and electricity providers then incorporate into energy planning and procurement efforts to help ensure these efforts do not overwhelm the grid.[7]) In addition, Senate Bill (SB) 100 (2018) and SB 1020 (2022) require that 100% of the electricity sold in California comes from renewable energy and zero carbon sources by 2045, with interim milestones of 90% by 2035 and 95% by 2040, helping drive reductions in power plant emissions.[8] CCAs and utilities in the BARCAP region have even more ambitious clean energy goals as shown above. The state also projects 52,000 MW of battery storage will be needed statewide in 2045.[9] Currently, there is a statewide goal of shifting 7,000 MW of electricity consumption to 'off-peak hours' by 2030. Title 24 Energy Code requires all new low-rise residential construction to have solar PV systems installed.[10] State policies influence development of local clean energy projects like microgrids and community solar as well. In addition, the Scoping Plan contains a goal of reducing cogeneration emissions to zero by 2040.[11]

Feedback from public engagement conducted during the development of the BARCAP showed strong regional support for generation of more clean energy (public survey results ranked as the top

strategy among 13 focus areas for climate action). At the same time, members of the BARCAP region's frontline communities who participated in the BARCAP engagement process expressed concern about rising electricity rates and the reliability of the grid. They also expressed interest in more education and outreach to increase their understanding of their electricity bills and opportunities to reduce them.

Based on this input and similar input from local governments and other stakeholders, affordability, rising electricity rates, and the need for resilient and reliable power were key considerations for measure development. Many factors contribute to rising electricity rates in the BARCAP region, including transmission and distribution costs, cost of procuring power, and wildfire mitigation efforts, among others.[12] Distributed energy resources - like solar paired with storage, standalone storage, load flexibility, and energy efficiency - have the potential to lessen the amount of new transmission and generation that is needed, which in turn can help contain future cost increases. They can also help reduce stress on the grid and improve its resilience. In addition, several new state laws focus on addressing affordability, lowering costs to ratepayers, and the reliability and resilience of the energy system, including SB 254 (2025) and Assembly Bill (AB) 825 (2025).

Community decarbonization hub: Glad Tidings church in South Hayward

Glad Tidings International C.O.G.I.C, in South Hayward, is the first of four Black churches in the Bay Area co-developing Community Decarbonization Hubs.[13] These hubs are resilient revenue-generating microgrids owned and operated by key community anchors that support the congregation and community during power outages and advance decarbonization efforts in the surrounding community. The church's microgrid – South Hayward Energy - includes a 0.3MW solar array, 1MWh of energy storage, electrification, energy efficiency, and nine electric vehicle charging stations in a frontline community with few current charging options. It supplies the church's energy needs with emissions-free electricity and the surplus energy powers EV chargers, generating revenue for the church on the order of $500,000 annually that can be invested back into the community through additional clean technologies and other services. The Community Decarbonization Hub model also includes training for local residents to maintain the microgrid.

This model is deployed by Gemini Energy Solutions and Green The Church Renewable Energy Development (GTC R.E.D.), with financial support from a revolving loan by the Kresge Foundation and financing from Freedman Green Bank & Trust. This collaboration is currently working with three other Bay Area churches. These resilient revenue-generating microgrids highlight the vital roles of community anchors in the clean energy transition and the innovative partnerships that can support them.

Not all communities experience energy-related impacts the same, so equity must be at the forefront when developing and implementing energy policies and solutions. Affordability is especially key for many low-income households who are particularly impacted by rising electricity rates, especially if they live in older energy inefficient homes. Those struggling to afford energy bills face the risk of utility service shut off for late or non-payment. Barriers to accessing clean energy technologies and incentives must be addressed, such as language, privacy concerns, and restrictive structural and financial requirements. Renters may also face the additional challenge of landlords who are not motivated to pay for clean energy and resilience upgrades. Ensuring frontline communities are energy resilient during Public Safety Power Shutoffs and blackouts can prevent food from spoiling, which would disproportionately impact low-income household budgets, and ensure cooling and medical devices continue working and medications stay refrigerated. Intentional efforts must be made to ensure these communities have access to the family-sustaining jobs generated by local clean energy and storage projects.



The BARCAP focuses on regional efforts that support small- to medium-scale clean energy and storage projects that can strengthen the resilience of the grid, support local jobs, help lower energy bills for subscribers of these projects, and speed up delivery of clean energy and storage.[14] It also focuses on efforts to equitably expand consumer programs that help customers adjust the timing and amount of their electricity consumption and deploy clean backup power and grid technologies more widely. These strategies can help support integration of new clean energy power and storage resources onto the regional grid to meet growing electricity demand for electrification in the BARCAP region and may help apply downward pressure on rates and GHG emissions.

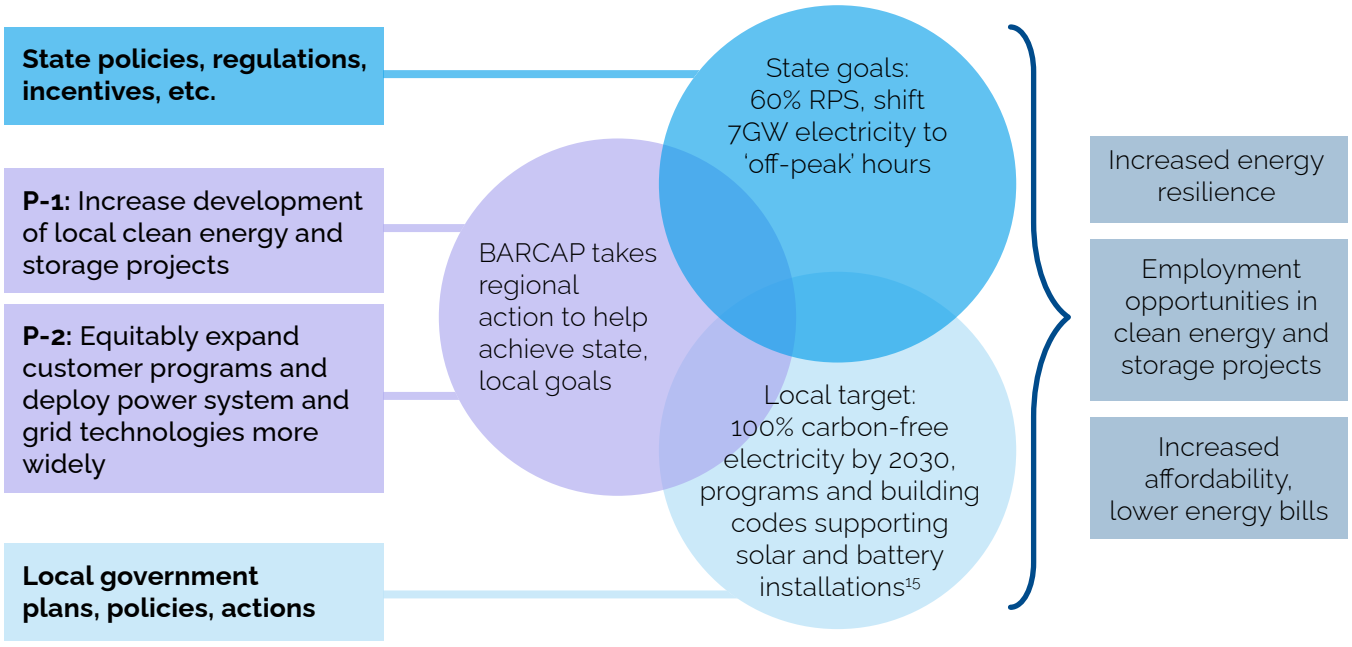
8.4 HOW PROPOSED MEASURES WERE DEVELOPED

As described in Chapter 4, measures and actions for the power sector were developed with extensive input from the public, frontline community members, Advisory Work Group members, and members of a technical stakeholder working group. The technical stakeholder working group was comprised of 14 subject matter experts representing local governments, community choice aggregators, utilities, regional agencies, and community-based organizations. These technical experts grounded measures in the current implementation landscape (including key hurdles and areas for action) and helped develop and refine the proposed measures and actions in collaborative meetings over six months. See Chapter 4 for an overview of BARCAP's sector-level technical working groups

The measures described below can be implemented with implementing partners' existing authorities.

8.5 POWER SECTOR MEASURES AND ACTIONS

Figure 8-2: Power measures contributing to state and local goals



The measures and actions for the power sector contribute to achieving state and local goals for the sector and result in many other key benefits. As shown in Figure 8-2, they complement, rather than duplicate, state and local actions in important ways. The measures and actions support successful local implementation of state policies and initiatives in ways that are equitable and bring benefits to the BARCAP region. They also help remove barriers and build capacity to accelerate local action and scale promising approaches regionally.

Measure P-1: Increase Development of Local Clean Energy and Storage Projects (with a Focus on Small- to Medium-Scale Projects), Including Behind-the-Meter and Distributed Energy Resources[16]

GHG reductions in 2045: Low *(see Figure 8-2 for an illustration of the GHG emission reductions enabled by these measures and actions and Appendix C for quantified reductions)*

Potential regional benefits:

- \+ Lower energy bills (for subscribers of on-site or community solar projects)
- \+ Strengthened regional grid resilience
- \+ Job creation potential
- \+ Increased/faster access to clean energy and storage
- \+ Reduced reliance on centralized generation and long-distance transmission

Design principles:

Climate resilience benefits: Clean backup power during outages, less strain on grid during periods of high demand by utilizing battery storage

Estimated costs of implementation: ✚

Proposed metrics: MW of clean power and storage installed in the BARCAP region with fraction on locally-identified sites (from P-1) noted, MW of community solar and/or brownfield-to-brightfield (especially serving frontline communities), percentage of low-income households with access to clean energy and storage

SUMMARY

Develop small- to medium-scale local clean energy and storage projects (<20 MW) that contribute to meeting state goals and exceed anticipated behind-the-meter deployment (BTM), and support an equitable and affordable transition to clean energy in the BARCAP region.[17] Focus projects where it is the best possible use of land given local and regional considerations (e.g., brownfields, rooftops, parking lots, capped landfills, under-utilized plots). Clean energy and storage projects might include but are not limited to BTM (including rooftop solar), community solar, microgrids, agrivoltaics, and feed-in tariffs.[18] These projects might include storage or storage might be deployed as a standalone project.

This measure encourages development of clean energy projects by addressing several obstacles and promoting a thoughtful approach to where projects are sited. These projects have the potential to lower electricity bills for subscribers and increase resilience against power outages, while reducing GHG emissions associated with electricity use.

Milestones for Initiation:

Initiation dates assume funding and staff resources are available and obtained. If not, shifting initiation dates may be necessary.

- ★ **Q2 2026 –** Identify and convene interested local governments and refine scope of support, begin identifying incentives and development of toolkit (P-1.1)
- ★ **Q4 2026 -** Kickoff workgroup for brownfield-to-brightfield/community solar to kickstart roadmap process (P-1.2)
- ★ **Q3 2026 -** Establish research scope and kickoff research with project team (P-1.3)
- ★ **Q3 2026 -** Conduct landscape analysis to identify gaps through convening and outreach (P-1.4)

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Public and Community Health

✚ Reduced exposure to health-damaging pollution from fossil-fuel powered electricity generation, particularly during high demand periods

✖ *Funding and financing gaps for small clean energy and storage projects may limit access to benefits for frontline communities*

Jobs and Workforce Development

✚ More employment opportunities in clean energy and storage projects

✖ *Reduced work in fossil fuel-powered electricity generation*

✖ *Employment opportunities could be challenging for low-income and disadvantaged jobseekers to secure without the necessary training for this relatively new market*

Community Engagement, Awareness, and Capacity

✚ Increased awareness and engagement in solutions builds 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*

Climate Resilience Co-Benefits

✚ Increased resiliency of energy grid and households, businesses, and community organizations to power outages, which disproportionately impact frontline households, and during periods of high demand like heat waves

Costs Burden

✚ Decreased energy cost burden for frontline subscribers to on-site or community solar

✖ *Maintenance costs (i.e., roof repair)*

ACTIONS

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

Implementation might include:

- **Identifying monetary and nonmonetary incentives for projects** (e.g., expedited permitting, updated zoning (overlays), including projects in feed-in tariffs, novel financing approaches);
- **Developing a toolkit for local governments with case studies, policy options, and model ordinances**;
- **Providing technical support and assistance**;
- **Supporting community engagement** (in partnership with community organizations).

Sites for consideration would include commercial and industrial sites (e.g., brownfields, landfills, large commercial rooftops, parking lots, under-utilized lots, etc.) and potentially public properties. Sites that serve frontline communities, including low-income and moderate-low-income communities and multifamily buildings, as well as critical community-serving facilities, would be prioritized to receive support. Consider potential climate impacts, like sea level rise or wild-urban interface, and land conservation goals.

Proposed Lead Implementer:
Regional agency or organization

Proposed Supporting Implementers:
Regional agency, local governments, community organizations, Community Choice Aggregators, utilities

Timeframe to start implementation:
Short-term/Medium-term



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

Establish a workgroup composed of community organizations representing community interests, developers, property owners (especially brownfield or industrial sites), renewable energy financing companies, local governments and community choice aggregators, focused on identifying solutions to advance and accelerate community solar and/or brownfield-to-brightfield projects in the BARCAP region. Special emphasis would be placed on projects that benefit frontline communities and multifamily renters. Review existing funding and financing options for these projects. Identify options to pilot project(s) from the roadmap.

Proposed Lead Implementer:
Regional agency or organization or community organization

Proposed Supporting Implementers:
Community organizations, Community Choice Aggregators, utilities, local governments

Timeframe to start implementation:
Short-term/Medium-term



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

Develop best practices for behind-the-meter and small- to medium-sized clean energy and/or storage projects. Development will be informed by a workgroup of local governments and developers and technical and policy analysis. Initial focus might be on sharing best practices for battery storage to encourage more consistency for permitting across the BARCAP region. (The state has streamlined permitting for rooftop solar.[19]) Identify mechanisms to support local governments as they update permitting.

Proposed Lead Implementer:
Regional agency

Proposed Supporting Implementers:
Local governments, project developers

Timeframe to start implementation:
Short-term



MEASURE P-1

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

Conduct a gap analysis or convene a work group to assess the sufficiency of current funding and financing for local clean energy and storage projects. Monitor a subset of the identified gaps. Deploy existing funding and financing in innovative ways to help close the gaps, including through increased awareness and accessibility of these programs (through coordination with Community Choice Aggregators, utilities, community organizations, and others) and potentially helping address building readiness. Explore new funding or financing mechanisms, including public private partnerships or novel financing approaches, and consider ratepayer impacts.

Proposed Lead Implementer:
Regional agency or organization

Proposed Supporting Implementers:
Community Choice Aggregators, utilities, community organizations, regional agency

Timeframe to start implementation:
Short-term





Measure P-2: Equitably Expand Customer Programs and Deploy Power System and Grid Technologies More Widely[20]

GHG reductions in 2045: Supporting *(see Figure 8-2 for an illustration of the GHG emission reductions enabled by these measures and actions)*

Potential regional benefits:

- \+ Increased resilience and reliability of the grid
- \+ Potential downward pressure on electricity rates and reduced customer costs
- \+ Increased access to consumer programs and clean backup power
- \+ Reduced reliance on fossil-fueled-backup generators (and associated noise and air pollution)

Design principles:

Climate resilience benefits: Clean backup power for continued operation of critical facilities, less grid strain during periods of high demand, enhanced wildfire resilience of reconductored power lines

Estimated costs of implementation: S

Proposed metrics: Number of critical public facilities and/or key community facilities with clean backup power, participation in demand flexibility programs and virtual power plants (especially by low-income households and frontline communities), number of local governments provided with information related to P-2.1 and P-2.2

SUMMARY

Expand consumer programs and deploy grid technologies and clean backup power resources to enhance flexibility, efficiency, reliability, and affordability of electricity delivery, while aligning with state goals and plans and reducing carbon emissions. (Consumer programs include demand flexibility solutions, such as demand-side management, virtual power plants, and vehicle-to-everything, and examples of technologies and resources include solar+battery projects that can disconnect from the grid, district geothermal heating and cooling, and grid enhancing technologies.[21]) Ensure access to and direct benefits from these programs, technologies, and resources for frontline communities, including low-income and moderate-low-income households and renters (particularly multi-family). (Note: use of residential batteries (encouraged in P-1) can provide valuable resilience benefits and support this measure).

This measure helps address the need for more resilient and reliable power in the BARCAP region and a more flexible, efficient, and reliable grid. It provides opportunities for customer cost savings through load flexibility solutions and downward pressure on electricity rates. A more efficient and modern transmission system can bring additional clean electricity into the BARCAP region and carry more locally generated clean electricity across the region.

Milestones for Initiation:

Initiation dates assume funding and staff resources are available and obtained. If not, shifting initiation dates may be necessary.

- ★ **Q3 2026 –** Direct local governments and community resilience centers to existing programs and technical assistance, and begin to develop case studies (P-2.1)
- ★ **Q3 2026-** Electricity providers and other implementers share best practices for scaling up demand-side flexibility solutions equitably (P-2.2)

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Public and Community Health

✚ Reduced exposure to health-damaging pollution from fossil-fuel powered electricity generation, particularly during peak or high demand periods

✚ Reduced exposure to noise and health-damaging pollution from diesel backup generators

Jobs and Workforce Development

✚ More employment opportunities in storage projects

✖ *Reduced work in fossil fuel-powered electricity generation*

✖ *Employment opportunities could be challenging for low-income and disadvantaged jobseekers to secure without the necessary training for this new market*

Community Engagement, Awareness, and Capacity

✚ Increased awareness and engagement in solutions builds trust between communities and the government

Climate Resilience Co-Benefits

✚ Increased resiliency of energy grid, critical public facilities, and key community facilities to power outages, which disproportionately impact frontline households, and during periods of high demand like heat waves

✖ *Potential harmful impacts to human health if efforts to improve resilience of the grid and facilities rely solely on diesel backup generators*

Costs Burden

✚ Potential downward pressure on electricity rates and customer costs

✚ Increased access to customer programs that can reduce customer costs

ACTIONS

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[22]

Support local governments and community organizations to identify and access funding and financing for the upfront costs and/or operation and maintenance of projects at key facilities, including resilience hubs. Coordinate this support with local government emergency response plans, managers, and networks. Collect and share case studies of successful procurement, development, and financing. In the near-term, some facilities may need hybrid systems to fully meet their reliability or resilience needs. Explore the important opportunity presented by resilient energy resources at schools to educate youth about clean power resources and clean energy jobs.

Proposed Lead Implementer:
Community Choice Aggregators, utilities, regional agency

Proposed Supporting Implementers:
County emergency operations staff, public facility staff, community organizations

Timeframe to start implementation:
Short-term



ACTIONS

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[23]

In the near-term (zero to two years): Electricity providers scale up demand flexibility solutions by:

- **Sharing best practices** (including protecting customer privacy and data), data, and lessons learned from pilots and existing programs;
- **Exploring new incentives and tariffs**;
- **Improving and coordinating customer outreach and education efforts to increase customer enrollment** (including multilingual and culturally relevant outreach and education in partnership with community organizations);
- **Expanding pilots in additional service areas**.

In the medium term (two to five years):

- **Securing funding and financing and conduct outreach in partnership with community organizations and a regional agency**, to support the equitable scaling of virtual power plants and other critical load flexibility solutions, particularly low-income and moderate-low-income households in frontline communities and key public facilities serving these communities;
- **Scaling load flexibility solutions for commercial and industrial customers**.

Proposed Lead Implementer:
Community Choice Aggregators, utilities

Proposed Supporting Implementers:
Regional agency, community organizations

Timeframe to start implementation:
Short-term/Medium-term

ACTIONS

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

Conduct source evaluation for BUGS, including:

- **Review of current BUG use and impacts**;
- **Review of emission controls and alternative technologies**;
- **Assessment of potential opportunities for rulemaking**, incentive, and/or outreach and education programs.

Lead Implementer:
Air District

Proposed Supporting Implementers:
Local governments, businesses

Timeframe to start implementation:
Medium-term

P-2.4: Modernize transmission and distribution lines to increase efficiency and improve reliability (e.g., grid-enhancing technologies, reconductoring)[24]

Update transmission and distribution lines with technologies that increase their efficiency (and therefore their ability to bring more clean energy into the BARCAP region) and their reliability. Leverage existing grants and loans to support this action.

Proposed Lead Implementer:
Utilities

Timeframe to start implementation:
TBD

Virtual power plants in Richmond

The Richmond Advanced Energy Community Project is a ground-breaking virtual power plant (VPP) pilot that provides up to 100 homes and 20 businesses the opportunity to electrify and save on their electricity bills.[25] This VPP pilot serves low-income households by providing smart, clean energy technologies including energy storage, smart thermostats, rooftop solar, heat pump space and water heating, and electric vehicle charging that are connected into one system which responds to the grid's needs. The VPP reduces appliance energy use during more expensive times of the day, provides clean electricity to the grid when needed, and stores energy from the grid when there is surplus (high generation and low demand), contributing to grid reliability and bill savings. Local small businesses are eligible for battery storage, which can provide resilience during grid outages, bill savings, and revenue generation potential.

The pilot project is a partnership of MCE and ZNE Alliance supported by a $5 million grant from the California Energy Commission and funding from the City of Richmond, CalEPA, and MCE. MCE is working to expand the VPP pilot across all MCE member communities with a priority on frontline communities along San Pablo Bay. Sonoma Clean Power Authority and Ava Clean Energy have VPP pilots as well. These projects provide replicable frameworks to expand VPPs and their significant benefits to customers and the grid.



8.6 FUNDING IMPLEMENTATION

Implementation of the power sector measures can be supported in part through existing funding and financing approaches. For example, California Public Utilities Commission's Self-Generation Incentive Program provides rebates for distributed energy systems at homes and public facilities to increase resilience and emergency preparedness. In addition, the California Energy Commission's (CEC) Electric Program Investment Charge (EPIC) funds research, supports deployment demonstrations, and addresses policy, market, and workforce barriers for clean energy technologies including energy storage projects. The CEC also offers zero- and low-interest loans for energy efficiency, generation, and storage projects. [26]Notably, PG&E's Community Microgrid Enablement Program and Microgrid Incentive Program fully fund microgrids at community facilities such as hospitals, fire stations, and markets. The programs listed above are not a comprehensive list of available funding. See Appendix G for other funding and financing sources, programs and partners, and examples of successful implementation. Additional funding and financing mechanisms will be needed to fully achieve the goals of this sector.

Data centers, air quality, and greenhouse gas emissions

The BARCAP region is home to many data centers powering the digital economy by storing, processing, and transmitting large amounts of information business and industry rely on. For example, data centers are crucial for email, e-commerce transactions, cloud-based computing and data analysis, and artificial intelligence (AI). As the use of power-intensive digital services like AI increases, data center energy demand will climb sharply with important implications for local air pollution, GHG emissions, and the electrical grid.

In California, data centers currently consume 5,580 gigawatt hours (GWh) of electricity annually (equivalent to nearly 3% of all electricity demand in 2023).[27] To meet increased energy demand from powering the digital economy, and importantly from the growth of AI, PG&E expects to add new data center load roughly equal to the demand of 2-3 million new homes in the Bay Area by 2029.[28] Growing data center energy demand may also impact the reliability and affordability of the entire energy system – key concerns for BARCAP stakeholders – when the costs of new energy infrastructure are passed onto ratepayers.[29]

Data centers also require reliable power and often depend on diesel or other fossil fuel-powered backup generators to ensure continuity, which can increase local air pollution exposure, including in areas already burdened with poor air quality. More than four-fifths of California's data centers are in the top 30% worst diesel emission zones, with nearly one-third in the top 10% worst zones.[30]

Meeting the rise in data center load growth with clean energy and backup power, while supporting a reliable grid and minimizing rate impacts, will be critical. The private and public sectors are working to identify innovative solutions to meet these objectives. For example, some local facilities will use low-carbon energy resources as primary on-site power sources and for backup generation.[31] Others are pursuing energy efficiency, demand response, and load flexibility to reduce annual electricity usage and are exploring how data centers could serve as a resource to the electric grid.[32]





ENDNOTES

1 For the BARCAP, clean energy is defined as zero-emissions technologies that produce electricity without emitting GHGs or harmful air pollution. Renewable natural gas and biodiesel are not considered clean energy sources due to air pollution impacts of combustion. Hydrogen, depending on how it is generated and used, may or may not be considered a clean energy source.

2 Load Flexibility," California Energy Commission, Accessed November 17, 2025, https://www.energy.ca.gov/programs-and-topics/topics/load-flexibility#:~:text=Load%20flexibility%2C%20also%20known%20as%20demand%20flexibility%2C,grid**%20*%20**Make%20the%20grid%20more%20resilient**."

3 Nearly all GHG emissions from this sector are CO_2 emission (99.5%), and over 95% of CO_2 emissions from the power sector are covered by the state's Cap-and-Invest program.

4 One MW (or Megawatt) can power about 750 to 1,000 homes, depending on the energy consumption profile of the home. One GW (or Gigawatt) is 1,000 MW.

5 California Energy Commission, "Solar PV Capacity and Installations for Systems 1MW and Smaller: 2022," California Open Data Portal, Accessed November 18, 2025, https://data.ca.gov/dataset/solar-pv-capacity-and-installations-for-systems-1mw-and-smaller-2022; California Energy Commission, "Utility Natural Gas Capacity and Generation by Jurisdiction and County: 2022," California Open Data Portal, Accessed November 18, 2025, https://data.ca.gov/dataset/utility-natural-gas-capacity-and-generation-by-jurisdiction-and-county-2022; California Energy Commission, "Utility Renewable Capacity by Type and County: 2022," California Open Data Portal, Accessed November 18, 2025, https://data.ca.gov/dataset/utility-renewable-capacity-by-type-and-county-2022.

6 California Energy Storage System Survey," California Energy Commission, Accessed November 17, 2025, https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/california-energy-storage-system-survey#:~:text=From%202018%20through%20the%20first%20quarter%20of,battery%20storage%20will%20be%20needed%20by%202045.

7 Stephanie Bailey et al., "Final 2024 Integrated Energy Policy Report Update," California Energy Commission, October 2025, https://efiling.energy.ca.gov/GetDocument.aspx?tn=266416.

8 The state projects that achieving zero carbon electricity by 2045 will require roughly tripling annual grid-scale solar and wind build rates and an eightfold increase in battery storage installation rates; Stephanie Bailey et al., "2023 Integrated Energy Policy Report," California Energy Commission, February 2024, https://efiling.energy.ca.gov/GetDocument.aspx?tn=254463.

9 California Energy Storage System Survey," California Energy Commission, Accessed November 17, 2025, https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/california-energy-storage-system-survey#:~:text=From%202018%20through%20the%20first%20quarter%20of,battery%20storage%20will%20be%20needed%20by%202045.

10 Solar PV, Solar Ready, Battery Energy Storage System (BESS) & BESS-Ready," California Energy Commission, Accessed November 17, 2025, https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/energy-code-support-center/solar.

11 Described as "combined heat and power" in the Scoping Plan.

12 Per California Public Utilities Commission, power lines are responsible for less than ten percent of wildfires, yet have been attributed as the cause of almost half of the most destructive wildfires in California history; "Wildfire and Wildfire Safety," California Public Utilities Commission, Accessed November 18, 2025, https://www.cpuc.ca.gov/industries-and-topics/wildfires.

13 Democratizing Clean Energy for All," Gemini Energy Solutions, Accessed November 19, 2025, https://www.geminiesolutions.com/; Nicole J. Caruth, "A California Network of Black Churches Is Embracing Solar Energy, EV Charging," Inside Climate News, September 7, 2025, https://insideclimatenews.org/news/07092025/california-black-churches-energy-transition/.

14 Siting utility-scale projects in the region (versus smaller projects) may raise concerns by local governments and others over land that otherwise could be used to meet housing demand or other pressing concerns. The BARCAP therefore focuses on small- to medium-scale projects that are less than 20MW.

15 City of Hayward, "Hayward Climate Action Plan," City of Hayward, January 31, 2024, https://www.hayward-ca.gov/sites/default/files/documents/CAP-Adopted-240130.pdf; City of Fairfield, "City of Fairfield Climate Action Plan," City of Fairfield, adopted December 3, 2024, https://www.fairfield.ca.gov/home/showpublisheddocument/12007/638695044261456923.

16 Behind-the-meter refers to generating power on the customer's side of the utility meter. Distributed energy resources refer to "diverse category of devices and technologies that interface with the electricity system at the distribution level, either directly connected to a distribution utility's wires or on an end-use customer's premises, behind the utility meter. Examples include distributed generation and storage, electric vehicles and charging stations, grid-interactive buildings and microgrids, as well as more traditional demand response or load flexibility resources and energy efficiency strategies"; "Distributed Energy Resources," California Energy Commission, Accessed November 18, 2025, https://www.energy.ca.gov/data-reports/california-energy-planning-library/distributed-energy-resources.

17 The capacity levels representing state goals are pulled from existing planning processes and forecasts to ensure alignment with already completed analysis and state goals. They are based on information from California Independent System Operator (CAISO) Transmission Planning Process (TPP) busbar mapping, which generally locates different utility-scale renewable energy and storage resources to various zones within CAISO's footprint to identify transmission constraints and support transmission planning needed to meet state goals. This analysis focused on two PG&E service territories (Greater Bay Area and North of Greater Bay Area. The Greater Bay Area and North of Greater Bay Area do not perfectly align with the BARCAP region. Therefore, the total increase in capacity estimate refers to the broader Bay Area region and some neighboring counties. Estimated forecasts for BTM deployment are from the CEC IEPR distribution generation forecasts (high) for the BARCAP region. For more information on the estimated combined totals for the Bay Area region and some neighboring counties based on these planning and data sources, as well as information on the approach to develop these estimates, see Appendix C.

18 A feed-in tariff (FIT) is "a standardized, long-term, guaranteed contract that allows smaller local renewable energy projects to sell power to the local utility or other load-serving entity. Market-based, cost-effective FITs with streamlined interconnection allow local businesses, residents, and organizations to install clean local energy projects in underutilized spaces…" MCE and Sonoma Clean Power currently have feed-in tariff programs.

19 State law mandates that most cities and counties implement an online, automated permitting platform for residential rooftop solar systems, SolarAPP+; "Residential Solar Permit Program Status Dashboard," California

Energy Commission, Accessed November 18, 2025, https://www.energy.ca.gov/programs-and-topics/programs/residential-solar-permit-reporting-program-sb-379/residential-solar.

20 Implementation of these measures involves voluntary actions, and no additional authority must be acquired by lead implementers to implement the measures.

21 Demand/load flexibility solutions help electricity customers "shift their energy usage to when electricity is cheaper and clean, and use less energy when the grid is under stress or running polluting power plants"; "Load Flexibility," California Energy Commission, Accessed November 18, 2025, https://www.energy.ca.gov/programs-and-topics/topics/load-flexibility; Virtual power plants are a software-based system to manage distributed energy resources - such as rooftop solar, batteries, electric vehicle chargers, and appliances (including smart thermostats, smart water heaters, smart plugs) –to support the grid and reduce costs to consumers. By aggregating distributed energy resources, they can help reduce the need for additional grid infrastructure and enhance local resilience. Vehicle-to-everything, also known as bi-directional electric vehicle charging, allows vehicle owners to use the energy stored in the electric vehicle's battery to power homes, grids, and other devices. Grid-enhancing technologies maximize the electricity transmission across the existing system through sensors, power flow control devices, and analytical tools (Department of Energy). They can reduce the need for new transmission infrastructure and enable the addition of clean, renewable power to the grid.

22 The goal is to produce as much day-to-day and resilient energy from renewable sources as possible and have some on-demand generation for critical missions for only when sun, wind or other intermittent sources or battery storage are inadequate at that time. Hybrid systems refer to including non-solar or storage-based resources along with solar power plus battery storage (and potentially other renewable generating sources like micro hydro, micro wind, etc.). These systems may be necessary if the amount or duration of power necessary to meet a facility's resilience needs cannot be met with solar+storage alone.

23 SB 786 (Dodd) requires the state to adopt a load shift goal. It is 7,000 MW by 2030.

24 Reconductoring is replacing old, existing power line conductors with newer, more efficient conductors, which can increase how much electricity they can carry.

25 MCE and Partners Unveil Virtual Power Plant, Bringing the "Home of the Future" to Life," MCE, August 7, 2024, https://cal-cca.org/mce-and-partners-unveil-virtual-power-plant-bringing-the-home-of-the-future-to-life/.

26 California Energy Commission, "Energy Conservation Assistance Act - Low-Interest Loans," *California Energy Commission, Accessed February 25, 2026, https://w*ww.energy.ca.gov/programs-and-topics/programs/energy-conservation-assistance-act/low-interest-loans.

27 Nanpeng Yu et al., "Enabling Energy Efficient Data Center in Smart Power Distribution Systems," California Energy Commission, May 2024, https://www.energy.ca.gov/sites/default/files/2024-05/CEC-500-2024-035.pdf; Average annual electricity consumption in California was 6,174 kilowatt-hours (kWh) per household in 2019; DNV GL Energy Insights USA, Inc., "2019 California Residential Appliance Saturation Study (RASS)," California Energy Commission, July 2021, https://www.energy.ca.gov/sites/default/files/2021-08/CEC-200-2021-005-PO.pdf.

28 Kristin Koenig, Data centers: energy usage reporting and modeling, U.S. Congress, House, Assembly Committee on Utilities and Energy, April 2, 2025, https://autl.assembly.ca.gov/system/files/2025-04/ab-222-

bauer-kahan.pdf.

29 Kristin Koenig, Data centers: energy usage reporting and modeling.

30 The same analysis found that census tracts in California with data centers have a median CalEnviroScreen pollution score of 7 out of 10. A score of 7 out of 10 means that communities in these census tracts experience more severe cumulative impacts from pollution and specific population characteristics than 70% of other census tracts in California; Cecilia Marrinan, "Data Center Boom Risks Health of Already Vulnerable Communities," Tech Policy Press, June 12, 2025, https://www.techpolicy.press/data-center-boom-risks-health-of-already-vulnerable-communities/.

31 Microsoft's San Jose data center will use renewable natural gas for a portion of its backup generation, and ECL's data center in Mountain View is using hydrogen as its primary power source. These power sources are not considered fully sustainable clean energy per BARCAP definition.

32 Nanpeng Yu et al., "Enabling Energy Efficient Data Center in Smart Power Distribution Systems"; Anuja Ratnayake, "Unlocking AI Potential with Data Center Flexibility," energycentral, Accessed November 18, 2025, https://www.energycentral.com/intelligent-utility/post/unlocking-ai-potential-with-data-center-flexibility-PtPoXIAuRMzs5Ff; Jason Plautz, "Study finds headroom on the grid for data centers," E&E News, February 13, 2025, https://www.eenews.net/articles/study-finds-headroom-on-the-grid-for-data-centers/.

9 Waste and Materials Sector

9.1 Vision for 2045

9.2 Sector overview

9.3 Context

9.4 How proposed measures were developed

9.5 Waste sector measures and actions

9.6 Funding implementation





9 Waste and Materials Sector

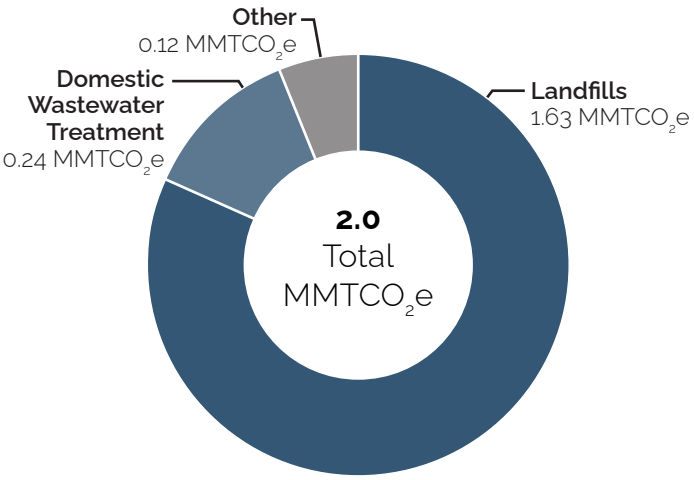
9.1 VISION FOR 2045

In 2045, very few materials are wasted. They are instead treated like valuable resources to meet community needs. Robust local food economies enable communities to thrive and eat healthy meals. Local builders use healthier, lower-carbon materials that are made regionally, and buildings are designed to be durable, adaptable, and use materials efficiently. Where materials are still not fully reused, recycled or repurposed, waste management facilities have better systems to reduce pollution and protect the air we breathe, especially in communities that have been impacted the most.

9.2 SECTOR OVERVIEW

The waste and materials sector include emissions that result from consuming and discarding food, goods, and building materials in the Bay Area Regional Climate Action Plan (BARCAP) region.

Figure 9-1: GHG emissions by waste and materials sub-sector for BARCAP region in 2022



The greenhouse gas (GHG) emissions from materials decomposing in the BARCAP region's waste management facilities were 2.0 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) (or 4% of regional GHG emissions) in 2022, as shown in Figure 9-1. GHG emissions from this sector have remained relatively stable since 1990, with landfills consistently contributing most to overall emissions. GHG emissions from the production of materials that are consumed in the BARCAP region are not included in BARCAP's GHG inventory because they occur predominantly outside the BARCAP region, but they can be as high as ten times greater than landfill emissions.[1] Therefore, the measures in this sector are designed to impact GHG emissions related to the whole lifecycle (from production to waste) of materials consumed in the BARCAP region through better material use.

This work builds on a history of leadership in sustainable materials management in the Bay Area. The BARCAP region is home to hundreds of food recovery groups that save millions of pounds of food each year. Urban and peri-urban farms and local markets help grow and share fresh food with communities. Local start-ups and innovators are making new low-carbon materials from natural materials like straw and mycelium or finding ways to safely reuse wood and other parts of buildings. Others are creating smart tools to track surplus food and measure the climate impact of building materials. Many cities in the BARCAP region include circular economy concepts in their climate action plans that highlight the multiple benefits of using materials more effectively to meet their communities' needs.





9.3 CONTEXT

California's main strategy to reduce waste-related emissions is the Short-Lived Climate Pollutants Act (Senate Bill 1383), which aims to reduce organic waste going to landfills by 75%, and recover and redirect 20% of currently wasted edible food to feed people. While Senate Bill (SB) 1383 is the state's main strategy to reduce waste-related GHG emissions, it is implemented primarily at the local level. Across the BARCAP region, food recovery organizations are rescuing millions of pounds of surplus food each year, and local governments are collecting organic waste including food scraps and yard trimmings to keep organics out of landfills. But the system still faces big challenges and local governments and food recovery organizations lack sustainable funding sources to continue and expand their work to meet the state's ambitious targets.

The United Nations estimates that food systems account for 30 percent of global GHG emissions with food loss and waste accounting for 8-10% of all emissions and costing a trillion dollars annually.[2] Food related emissions within the Bay Area is much smaller, but the BARCAP region can contribute to reducing these emissions by reducing the amount of food that is wasted and shifting consumption away from high-emission foods (meat, dairy, and highly processed foods) to those with lower emissions profiles (plant-based proteins and less processed foods).

Building materials like concrete, steel, and insulation are responsible for over 10%

of global GHG emissions.[3] Although most of these GHG emissions also occur outside of the BARCAP region, they can be reduced regionally through informed design and material selection and sourcing. California is working to cut the GHG emissions associated with the lifecycle production of building materials, or "embodied carbon," by 40% by 2035 through new rules under Assembly Bill 2446. The California Green Building Code (CALGreen) requires projects to reduce embodied carbon by reusing parts of old buildings, choosing low-carbon materials, or designing buildings to reduce overall lifecycle emissions.

Reusing materials that are yielded through deconstruction can reduce waste and pollution, including dust containing hazards such as lead and asbestos. Building for longevity through durability and resilience, retrofitting to increase energy efficiency, and planning for adapting to future uses can extend lifetimes of buildings and reduce the demand for new building materials.[4] The Bay Area's local governments have been leading the low-carbon building movement, including Marin County's low carbon concrete code and San Mateo County's requirements for construction and demolition waste reduction plans. Working with the construction industry and economic development agencies can result in more low-carbon building resources in the BARCAP region, while reducing the region's reliance on imported materials.



Marin County low carbon concrete code

Concrete is a widely used building material, whose production contributes roughly 8% of global greenhouse gas emissions. To address these emissions, Marin County adopted one of the nation's first low carbon concrete building code requirements in 2019. The ordinance places limits on the carbon intensity of concrete used in permitted projects in unincorporated Marin County.

The code was designed for feasibility, allowing a range of carbon limits tied to different concrete strengths and offering multiple compliance pathways. Supported by an Air District grant and facilitated by the Carbon Leadership Forum, development of the code included extensive engagement with stakeholders—concrete and cement producers, local governments, NGOs, architects, engineers, and contractors—as well as analysis of concrete mixes and testing on pilot projects. These steps ensured the limits were practical and effective.

Concrete mixes created to comply with Marin's ordinance are now being used across the region. Marin's process and code language have been documented as a precedent, inspiring two other Bay Area jurisdictions and influencing efforts in Southern California and other states. The ordinance predated and informed California's statewide CALGreen embodied carbon limits on concrete.

Based on the feedback from public engagement conducted during the development of the BARCAP, there is support for waste reduction, recycling, and composting. Public survey results ranked these among the top five of 13 potential focus areas for climate action by nearly a third of respondents. A similar number of respondents also ranked strengthening local food production and consumption through reduced food waste and stronger food security as a top-five strategy for potential focus areas. Members of the BARCAP region's frontline communities who participated in the BARCAP engagement process expressed the importance of having access to healthy, affordable food and buildings. They emphasized the important role of community organizations in filling gaps in the food system and strengthening their ability to grow, distribute, and compost food in their communities. Health impacts were an important concern, particularly related to plastics, toxins in building materials, and an inequitable air pollution burden from waste management facilities.

In an equitable Bay Area, all people would have adequate access to the material resources they need to live healthy lives. This means access to healthy foods, living in homes built with nontoxic materials, and access to clean, odor-free air, even near waste management facilities. It also means that the economies and supply chains that deliver those materials to Bay Area residents provide economic benefits like quality jobs and family-supporting incomes equitably to all Bay Area communities.[5] It is critical that all communities, especially those that have been historically marginalized, have a voice in developing equity-centered policy solutions.



The BARCAP focuses on regional efforts in three areas: supporting community-based initiatives for food recovery, production, distribution, and composting to address food insecurity and reduce the amount of organics sent to landfills; increasing the use of low-carbon, reused, and nontoxic building materials; and enabling proper waste sorting and treatment to decrease the amount of organics going to landfill and to manage waste-related facilities to minimize GHG emissions.

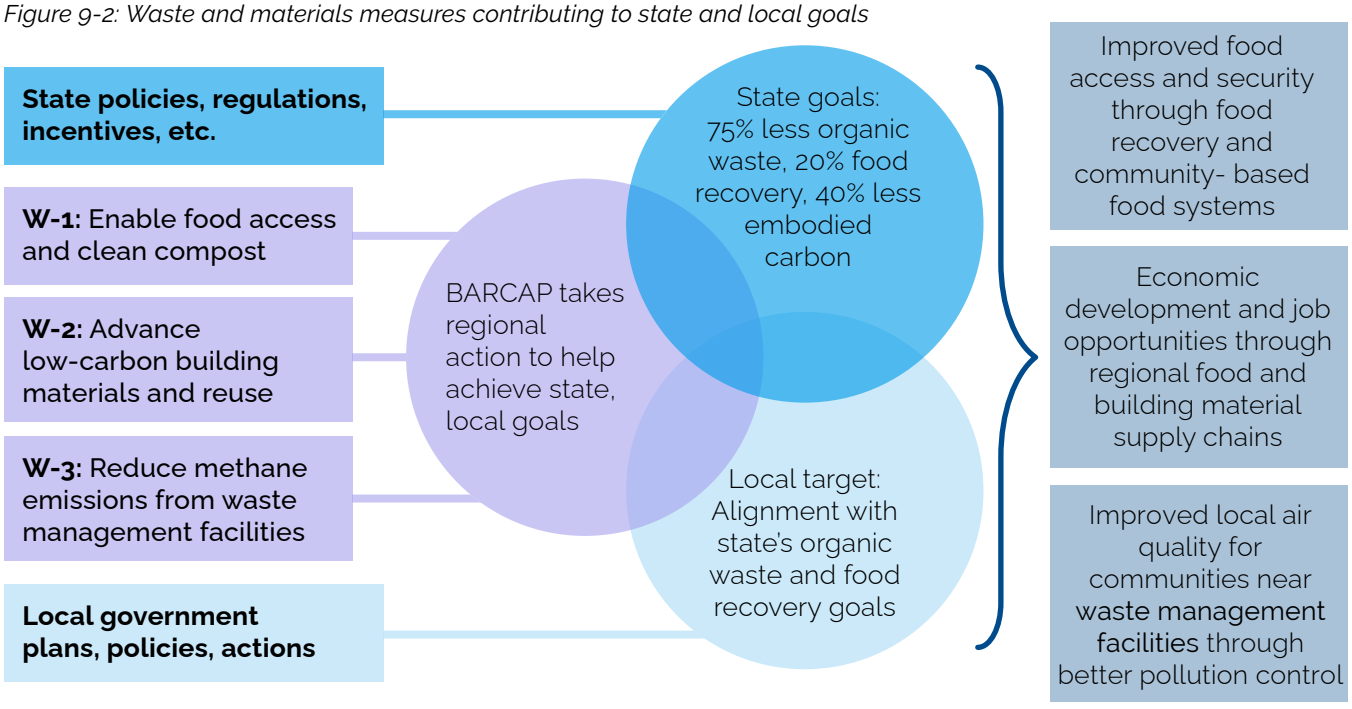
9.4 HOW PROPOSED MEASURES WERE DEVELOPED

The process to develop waste and materials sector measures leveraged existing networks addressing food recovery and building materials. These included convening a group of local governments implementing Senate Bill (SB) 1383 (2016) and their active food recovery organization partners for two conversations to design Measure W-1 Enable Food Access and Clean Compost. Measure W-2 Advance Low Carbon Building Materials built upon a round of conversations by the Bay Area Deconstruction Working Group and an additional convening of local governments considering embodied carbon policies across the Bay Area.[6] These technical experts grounded measures in the current assessment of implementation, key hurdles, and areas for action, and were foundational in shaping these measures. See Chapter 4 for an overview of BARCAP's sector-level technical working groups.

The measures described below can be implemented with implementing partners' existing authorities.

9.5 WASTE SECTOR MEASURES AND ACTIONS

Figure 9-2: Waste and materials measures contributing to state and local goals



The measures and actions for the waste and materials sector contribute to achieving state and local goals for the sector and result in many other key benefits. As shown in Figure 9-2, they complement, rather than duplicate, state and local actions in important ways. The measures and actions support successful local implementation of state policies and initiatives in ways that are equitable and bring benefits to the BARCAP region. They also help remove barriers and build capacity to accelerate local action and scale promising approaches regionally.



Measure W-1: Enable Food Access and Clean Compost

GHG reductions in 2045:
Low[7] *(see Figure 9-2 for an illustration of the GHG emission reductions enabled by these measures and actions and Appendix C for quantified reductions)*

Potential regional benefits:

- \+ Improved community health
- \+ Reduced cost burden through increased access to food
- \+ Reduced exposure to emissions near waste treatment facilities
- \+ Creation of food recovery jobs
- \+ New green spaces and community gardens

Design principles:

Climate resilience benefits: Compost added to agriculture lands to support water retention, soil structure, and stable food production; improves ability of natural lands to recover from climate shocks; creates more local, robust food recovery systems; increased food security during extreme weather

Estimated costs of implementation: $

Proposed metrics: Pounds of food recovered to feed people.

SUMMARY

Support local governments and food recovery organizations to more effectively meet their food recovery and composting goals and overcome implementation hurdles to implement Senate Bill 1383 goals to reduce landfilled organic waste by 75% and recover 20% of edible food.

This measure addresses the persistent lack of resources to fund food recovery and the common barriers to successfully sorting organic waste to create clean compost. Every county in the Bay Area is working toward meeting SB 1383 requirements and regional coordination will make this work more effective across all eight counties in the BARCAP region.

Milestones for Initiation:

Initiation dates assume funding and staff resources are available and obtained. If not, shifting initiation dates may be necessary.

- ★ **Q2 2026:** Begin convening networks of food recovery organizations, counties, and other stakeholders to share data, best practices, and needs
- ★ **2027**: Identify potential funding mechanisms and mutual benefit arrangements for food recovery capacity
- ★ **2028**: Survey BARCAP region's educational materials on lifecycle carbon and health impacts of consumption and strategies for behavior change and community-scale solutions

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Public and Community Health

✚ Improved food access from edible food recovery

✖ *Sometimes the food recovered is highly processed and unhealthy*

Community Engagement, Awareness, and Capacity

✚ Increased awareness and engagement in solutions builds 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*

Jobs and Workforce Development

✚ Funding to enable food recovery workers to be paid instead of relying on volunteer labor

ACTIONS

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

Expand capacity for edible food recovery operations and training for businesses and institutions that generate surplus edible food to enable at least the minimum edible food recovery requirement in SB 1383 and deliver food to people experiencing food insecurity. Steps to implement this action include:

- **Assessing the funding need for food recovery**, grounded in data of actual cost of service;
- **Pursuing a sustained and dedicated funding source**, potentially paid for by the BARCAP region's largest food waste generators;
- **Designing the funding to be accessible to food recovery organizations** with effective and equitable food distribution models;
- **Strengthening regional and local networks of food recovery organizations** to enable them to pursue funding collectively;
- **Supporting these networks to develop mutual benefit arrangements for shared assets** (e.g., clean air vehicles, food processing and storage facilities and equipment ideally with low global warming potential refrigerants, and software).

Lead Implementers:
Counties

Supporting Implementers:
Food recovery organizations

Timeframe to start implementation:
Short-term

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

Coordinate joint efforts across counties to minimize duplication of effort and share best practices with local governments and waste haulers, including strategies to:

- **Translate informational materials and target education and incentives to multifamily residents and property owners and managers**, small mom and pop, minority-owned businesses and restaurants, and multi-tenant commercial properties;
- **Reduce single-use foodware and plastics** through regionally aligned messaging, incentives, and policies that advance reusable foodware and other alternatives;
- **Understand and advocate for materials that are truly compostable or recyclable** in current markets and infrastructure;
- **Include in waste hauler agreements the use of new technologies** that enable real-time monitoring and feedback on proper sorting (e.g., cameras in trucks and bins, artificial intelligence analysis of discard streams);
- **Receive feedback from compost users in natural and working lands** to improve strategies to reduce contamination.

Lead Implementers:
Counties

Supporting Implementers:
Waste haulers

Timeframe to start implementation:
Medium-term



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

Include information about lifecycle, health, and community impacts of materials in messages distributed to communities by regional and local governments. Partner with schools to educate youth about health, climate literacy, and community-scale entrepreneurship. Impacts and benefits to highlight include:

- **Lifecycle environmental impacts and reduction actions** (such as plant-based diets);
- **Health concerns** including toxic chemicals, microplastics, and food date labeling;
- **Community resilience**, food security, and economic benefits from community-scale food production, distribution, recovery, gleaning, and composting.

Lead Implementers:
Local governments

Supporting Implementers:
Schools, food producers, food recovery organizations, community composters, health agencies

Timeframe to start implementation:
Medium-term



Measure W-2: Advance Low-Carbon Building Materials and Reuse

GHG reductions in 2045: Supporting. *In addition to supporting the reduction of materials entering landfills, this measure has the potential to reduce embodied carbon – which includes emissions outside of the BARCAP region but caused in the production of materials that are used in the region – by up to 50 million $MTCO_2e$ between 2025 and 2045 (or 2.5 million $MTCO_2e$ per year) if embodied carbon is reduced by the Assembly Bill 2446 target of 40%.*

Potential regional benefits:

- \+ Reduced exposure to health-damaging demolition dust containing asbestos, lead, etc.,
- \+ Reduced exposure to health-damaging toxins off-gassing from building materials
- \+ Improved housing quality, job creation (supply chain and deconstruction)
- \+ Anti-displacement if existing buildings are retrofitted to provide more housing units

Design principles:

Climate resilience benefits: Increased building resilience to disasters including wildfire and flooding; increased building durability and lifespans

Estimated costs of implementation: S

Proposed metrics: Amount of used building material salvaged by resellers, amount of carbon dioxide equivalent decrease in embodied carbon from a baseline measured by the California Air Resources Board

SUMMARY

Reduce waste and GHG emissions associated with building materials in alignment with Assembly Bill 2446 (2022) goals to reduce embodied carbon by 40% by 2035 through expansion of the California Green Building Code and economic development initiatives that advance deconstruction and reuse, material efficiency, and the prevalence of carbon storing, low-carbon, and healthy building materials.[8] Actions are informed by a series of convenings of the Bay Area Deconstruction Working Group.

This measure leverages the growing interest among local governments and building sector leaders advancing low carbon building materials and design across the eight counties in the BARCAP region. It is a step to ensuring compliance with Assembly Bill 2446 among the region's construction industry, for which CARB is developing embodied carbon reporting requirements of construction projects and product manufacturers. It seeks to remove barriers to low-carbon construction by providing education and supporting economic development to increase the availability and supply of low-carbon materials.

As in the buildings sector, recently passed state legislation will impede the development of local residential reach codes related to building materials until 2031.[9] Cities and counties can continue to pursue codes for nonresidential construction and shift their focus to enforcing existing codes. Delayed access to reach codes as an action pathway increases the importance of economic development actions to increase voluntary market adoption.

Milestones for Initiation:

Initiation dates assume funding and staff resources are available and obtained. If not, shifting initiation dates may be necessary.

- ★ **2028**: Engage in CALGreen code update cycle
- ★ **2028**: Standardize deconstruction surveys and identify priority materials for salvage
- ★ **2030**: Begin study to understand existing building stock for opportunities to improve utilization rates and future material reuse

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Housing Quality and Security

✚ Improved occupant health from the use of nontoxic materials

✖ *Low-carbon materials or deconstruction practices may have higher upfront costs, passed onto renters or home buyers*

Public and Community Health

✚ Reduced exposure to demolition dust and off-gassing

Jobs and Workforce Development

✚ Employment opportunities in low-carbon building trades

✖ *Employment opportunities could be challenging for low-income, disadvantaged jobseekers to secure without the necessary training for this new market*

Community Engagement, Awareness, and Capacity

✚ Increased awareness and engagement in solutions builds trust between communities and the government

Climate Resilience Co-benefits

✚ Greater scrutiny and attention paid to building materials, including which materials are more resilient to fire and flooding

Cost Burden

✖ *Introducing new requirements can increase the cost of construction*

ACTIONS

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

Engage with local governments to implement amended building codes and CARB reporting requirements to encourage material efficient building design and lower carbon material choices, deconstruction surveys, and use salvaged materials. Increase the code's effectiveness by supporting its implementation. This action includes:

- **Providing comments and information during code development processes;**
- **Creating templates for local reach code adoption** (as allowable by the state);
- **Providing training and resources** (e.g., those developed by state agencies or architectural associations; potentially providing continuing education credits) to local building officials, engineers, and design teams to support implementation and enforcement of existing codes;
- **Coordination across jurisdictions** for regional consistency to ease compliance by construction teams that work across the BARCAP region;
- **Lead by example through government procurement** using current best practices, materials, and processes for their building and infrastructure projects, and continue to evaluate new options as they become available.

Lead Implementers:
Local governments

Supporting Implementers:
Industry associations

Timeframe to start implementation:
Medium-term



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

Increase adoption of reuse and low carbon practices by project teams (consisting of developers, architects, engineers, contractors) and increase the availability of low carbon materials in the BARCAP region through:

- **Information sharing and education** through existing networks and industry associations;
- **Public recognition**, faster permitting for deconstruction or projects pursuing certifications like TRUE or Zero Carbon;
- **Identification of priority materials and products to focus on for the Bay Area;**
- **Economic development** including workforce training, entrepreneurship support, and physical infrastructure such as space for manufacturing, research and prototyping, and storing salvaged materials;
- **Collaboration with rural economic development** agencies and initiatives in natural and working lands for regeneratively sourced wood and agricultural building materials.

Lead Implementers:
Local governments

Proposed Supporting Implementers:
Industry associations, economic development agencies, research institutions

Timeframe to start implementation:
Medium-term

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

Assess how much vacant space and reusable materials are in existing buildings in cities across the BARCAP region. Compile economic, land use, assessments of salvageable materials, and building type and age information to establish a regional understanding that will enable the BARCAP region to:

- **Identify opportunities to retrofit underused commercial and oversized residences** to accommodate more housing units or community-based economic development (e.g., pop-ups in vacant retail spaces) and designing for future adaptive reuse;
- **Identify commercial sites for storing and processing salvaged building materials**;
- **Target materials to deconstruct and salvage** when buildings are taken down or remodeled.

Lead Implementers:
Local governments

Proposed Supporting Implementers:
Regional governments, deconstruction assessors and contractors, research institutions

Timeframe to start implementation:
Medium-term



Measure W-3: Reduce Methane Emissions from Waste Management Facilities

GHG reductions in 2045:
NE

Potential regional benefits:
+ Reduction of odors and other co-pollutants

Design principles:

Climate resilience benefits:
Community health, potential improvements to hazard mitigation at affected facilities

Estimated costs of implementation:
NE

Proposed metrics: Adoption of new or amendment of existing rules

SUMMARY

Reduce methane emissions through expansion or amendment of existing Air District rules or engage in new rulemaking to address sources such as compost facilities.

California's Landfill Methane Regulation requires municipal solid waste landfills to reduce methane and other air pollutant emissions through emissions monitoring and through capturing fugitive methane. The state adopted amendments in Fall 2025 that will help reduce health effects and GHG emissions from landfills in the region.

Milestones for Initiation:

Initiation dates assume funding and staff resources are available and obtained. If not, shifting initiation dates may be necessary.

★ **Q4 2026**: Begin review of existing rules

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Public and Community Health

✚ Reduced methane and non-methane volatile organic compounds including odorous substances from organic waste handling facilities may improve air quality

Community Engagement, Awareness, and Capacity

✚ Increased awareness and engagement in solutions builds trust between communities and the government

ACTIONS

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

Review regulatory mechanisms to reduce emissions. Conduct outreach to facility operators and impacted communities. Develop specific requirements for facilities. Based on findings, determine whether rule development is needed and initiate that process.

Lead Implementer:
Air District

Timeframe to start implementation:
Medium-term





9.6 FUNDING IMPLEMENTATION

Implementation of the waste sector measures can be supported in part through existing funding and financing approaches. Examples of possible opportunities include CalRecycle's Organics Grant Program which funds organic waste facility construction or expansion, and the U.S. Environmental Protection Agency's C-MORE Grant Program which offered funding to support reducing embodied GHG emissions from construction materials. The programs listed above are not a comprehensive list of available funding. See Appendix G for other funding and financing sources, programs and partners, and examples of successful implementation. Additional funding and financing mechanisms will be needed to fully achieve the goals of this sector.

ENDNOTES

1 "Documentation for greenhouse gas emission and energy factors used in the waste reduction model (WARM)," United States Environmental Protection Agency, Office of Resource Conservation and Recovery, 2020, https://www.epa.gov/sites/default/files/2020-12/documents/warm_background_v15_10-29-2020.pdf.

2 "Greenhouse Gas Emissions from Agrifood Systems," Food and Agriculture Organization for the United Nations, 2024, https://openknowledge.fao.org/server/api/core/bitstreams/111b7ee8-282b-42ff-ad95-cccecd90f8ea/content; "Food loss and waste account for 8-10% of annual global greenhouse gas emissions; cost USD 1 trillion annually," United Nations Framework Convention on Climate Change, September 30, 2024, https://unfccc.int/news/food-loss-and-waste-account-for-8-10-of-annual-global-greenhouse-gas-emissions-cost-usd-1-trillion.

3 "Bringing Embodied Carbon Upfront," World Green Building Council, 2019, https://worldgbc.org/climate-action/embodied-carbon/.

4 In some cases, replacing old buildings with new construction that is more energy efficient or space efficient and better serves the land use potential of a site may be more effective at lowering overall GHG emissions.

5 According to the State of California's Future of Work Commission "Quality jobs provide a living wage, stable and predictable pay, control over scheduling, access to benefits, a safe and dignified work environment, and opportunities for training and career advancement." (p. 3); "A New Social Compact for Work and Workers," California Future of Work Commission, 2021, https://www.labor.ca.gov/wp-content/uploads/sites/338/2021/02/ca-future-of-work-report.pdf#:~:text=Ensure%20that%20more%20workers%20have%20quality%20jobs.,workers%20report%20being%20in%20a%20quality%20job.

6 The Bay Area Deconstruction Working Group is composed of representatives of government, construction industry, and nonprofits, in fall 2024 to discuss strategies to increase the use of salvaged materials. It was convened by San Francisco Environment Department, EPA Region 9, and supported by StopWaste. Information can be found on StopWaste's website: https://www.stopwaste.org/at-work/built-environment/construction-demolition-debris/bay-area-deconstruction-workgroup.

7 While emissions reductions are low within the BARCAP region, food waste prevention contributes to avoiding emissions beyond the BARCAP region related to food production - agricultural activities, processing, and transportation.

8 Deconstruction is the systematic dismantling of a structure, or portion thereof, to maximize the salvage of materials for reuse, in preference over salvaging materials for recycling, energy recovery, or sending the materials to the landfill.

9 California Congress, House, Committee of Budget, Housing, AB 130, Approved by Governor June 30, 2025, https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202520260AB130

10 Natural and Working Lands Sector

10.1 Vision for 2045

10.2 Sector overview

10.3 Context

10.4 How measures were developed

10.5 Natural and working lands measures and actions

10.6 Funding implementation





10 Natural and Working Lands Sector

10.1 VISION FOR 2045

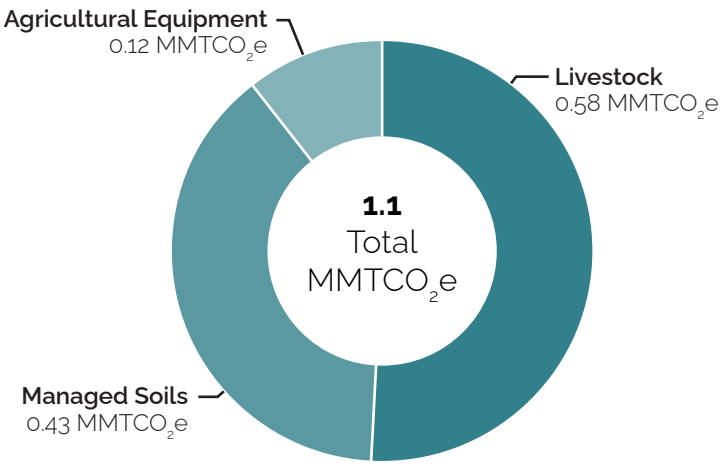
In 2045, natural and working lands are minimally impacted by wildfires, drought, and development, and have been made healthier by implementation of nature-based solutions. These lands will continue to sequester carbon, cool cities, provide clean drinking water, produce economically sustainable food and fiber crops, and support iconic ecosystems like redwood forests.

10.2 SECTOR OVERVIEW

The natural and working lands (NWL) sector includes carbon stocks held in plants and soils in agricultural and forestry lands (working lands) and natural ecosystems like wetlands, forests, and grasslands (natural lands), as well as greenhouse gas (GHG) emissions from agricultural equipment and livestock.[1]

Fossil-fuel powered agricultural equipment and livestock methane accounted for most of the GHG emissions from agriculture (see Figure 10-1), totaling 1.1 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) in 2022 (or 2% of total regional GHG emissions).

Figure 10-1: GHG emissions by agriculture sub-sector for BARCAP region in 2022



The NWL sector is unique as it is the only sector with the potential to be a carbon sink in addition to a GHG emissions source.[2] NWL also provide critical benefits to Bay Area communities beyond carbon sequestration, such as clean drinking water, food and fiber crops, urban green spaces that cool cities and protect communities from flooding, and iconic natural landscapes including wetlands (tidal and delta) and redwood forests. An illustration of land cover types across the Bay Area Regional Climate Action Plan (BARCAP) region is shown on the following page in Figure 10-2, with total carbon stocks held in plants and soils shown in Figure 10-3. In 2022, the BARCAP region's plants and soils held over 92 million metric tons of carbon (MMT C), which is over six times larger than total annual GHG emissions across the BARCAP region.[3] The three largest contributors to carbon stocks are forests (50%), developed lands (12%), and grassland/herbaceous lands (11%). The massive amounts of carbon held in the BARCAP region's plants and soils emphasize the importance of preserving and enhancing these carbon stocks to achieve the region's climate goals. If current statewide trends continue, NWL are projected to be a net source of GHG emissions through 2045, mainly because of loss of plants and soil carbon stocks from land conversion and climate impacts like drought and wildfire.[4] These trends can be observed at the regional level: significant spikes in historic regional emissions from the sector were caused by wildfires in 2017 and 2020, two of the most severe wildfire years in California's history.

Figure 10-2: Land Cover Classes for BARCAP Eight-County Region (2022)

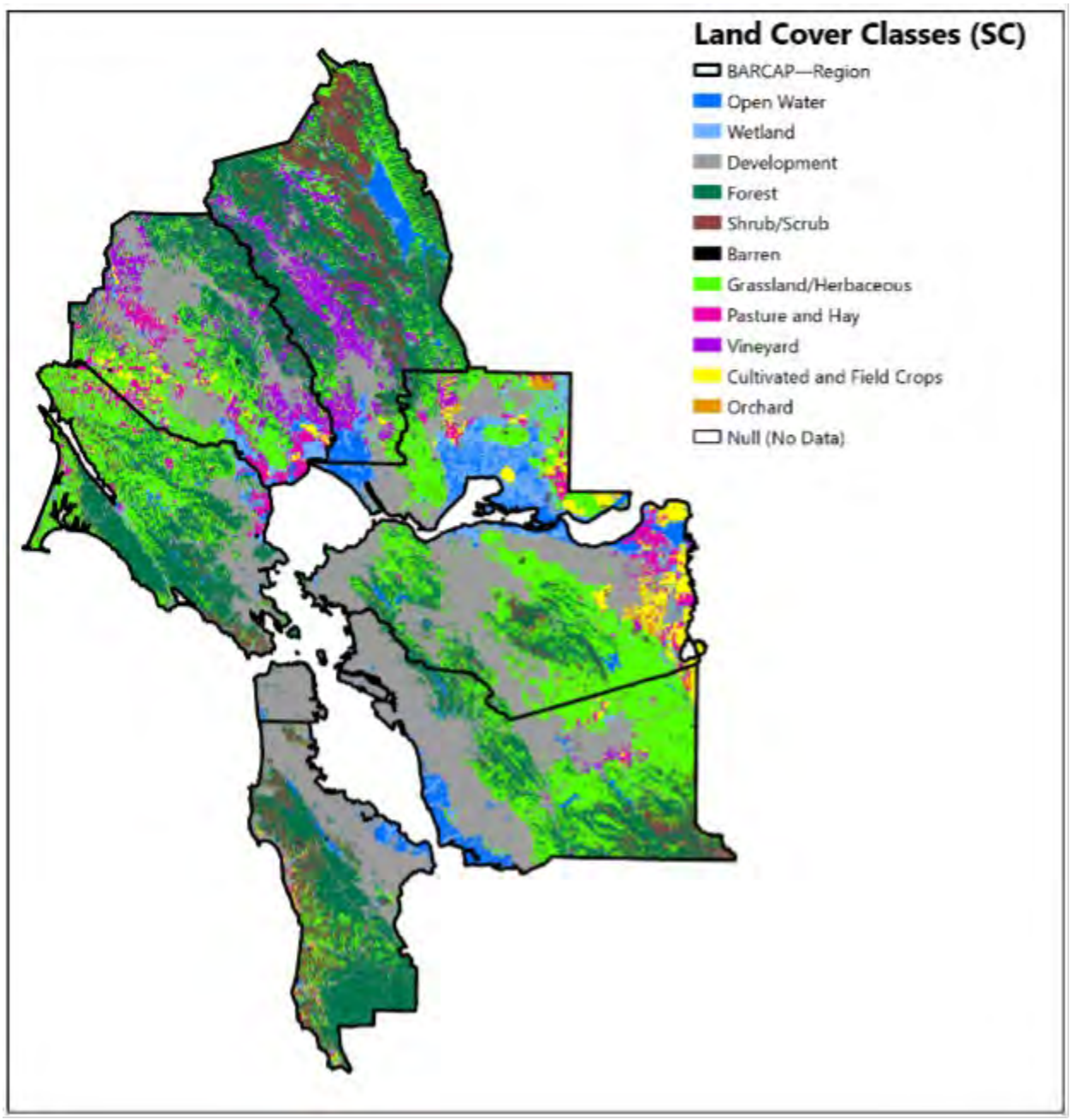
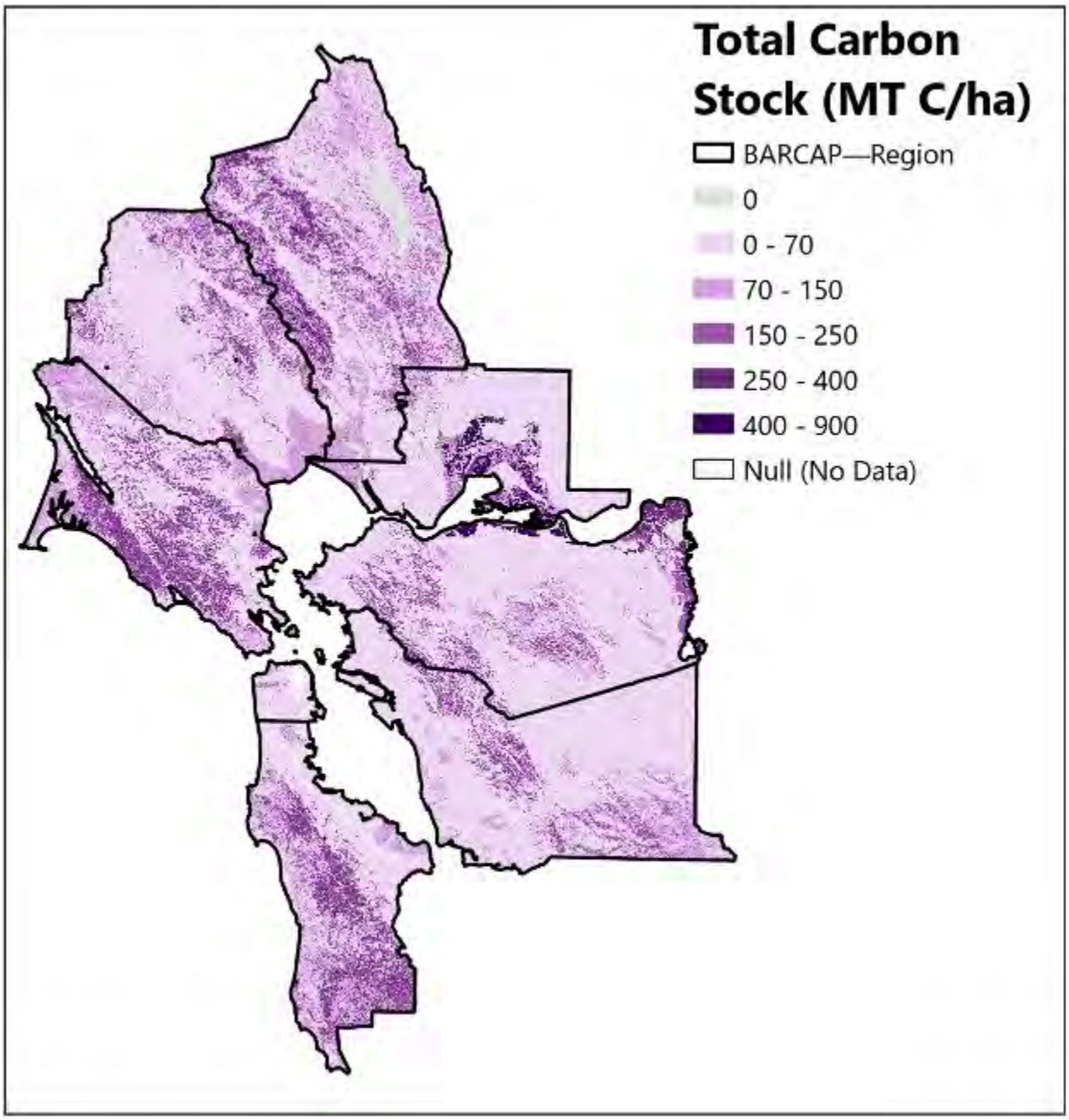


Figure 10-3: Carbon Held in Soils and Plants (2022)



Despite the forecast of declining carbon stocks and intensifying impacts of climate change across the state, implementers in the Bay Area have made important progress in both protecting existing ecosystems and agricultural lands, while also bringing forward nature-based solutions that increase carbon sequestration. Progress of note include:[5]

- Over 2.2 million acres of lands conserved in the BARCAP region by 2024;
- Over $14.3 million invested in climate beneficial agriculture projects in the BARCAP region as of 2025;

- Over 58 thousand acres of fuel treatment applied across the BARCAP region;
- 13 thousand acres of wetlands restored between 2000-2021 in the Bay Area.

10.3 CONTEXT

The State of California is increasingly recognizing the role of NWL in climate action. The California Air Resources Board 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan) included accounting and forecasting of NWL carbon stocks for the first time and included ambitious statewide targets for nature-based solutions, including:

- Conservation of 30% of California lands and waters by 2030;
- Reducing wildfire risk through annual fuel treatments on 2.3 million acres of forest, shrubland, and grassland;
- Increasing organic agriculture to 20% of all croplands;
- Restoring 60,000 acres of delta wetlands;
- Increasing urban forestry investment by 200%.[7]

Even if these targets are achieved, the outcome will slow, but not reverse, losses of carbon stocks across the state. Wildfire in particular is projected to drive large losses of carbon stocks, especially carbon rich forests, through 2045. Fortunately, the BARCAP region is home to a deep bench of technical experts, long-term implementers, and advocates for nature-based solutions. Historically, natural lands preservation and expansion activities are recognized for their value in conservation, outdoor recreation, water quality protection, habitat and biodiversity protection, wildfire prevention, and sustainable agriculture. While these qualities are recognized as 'co-benefits' in the context of the BARCAP, they have been the primary motivation for implementing what

East Bay Regional Park District: 'fighting fire with fire' with the carbonizer

In 2020, climate change-fueled drought produced over 1,500 acres of dead and dying trees in East Bay Regional Parks, including eucalyptus. The dead trees presented both a wildfire risk and a logistical challenge. Typical methods to clear and move wood are carbon intensive and costly (long-distance diesel truck transportation) or produce smoke and GHGs (open pile burning). Instead, the East Bay Regional Park District (EBRPD) turned to the carbonizer, a machine that burns organic matter at over 1,300 degrees Fahrenheit through a lower-emissions process. The carbonizer produces biochar, which can be added to soils to improve water retention, increase crop productivity, capture contaminants in soil, and increase long-term carbon sequestration. This effort was the first of its kind in California, reducing 14,049 tons of biomass tons of dead trees to 821.5 tons of biochar, which was then used at Ardenwood Historic Farm and other regional parks as a beneficial soil amendment. As of 2025, the Park District has thinned and removed hazardous trees and brush on 667 acres at Anthony Chabot Regional Park using a carbonizer, with additional work planned.[6]

is generally referred to as nature-based solutions. Nature-based solutions that protect existing carbon stocks include:

- **Land conservation**, which protects carbon held in natural and working lands from being lost to development;
- **Wildfire mitigation strategies and fuel management**, which reduces the chance of catastrophic wildfire;
- **Ecosystem restoration**, which makes existing carbon-rich landscapes more resilient to the effects of climate change like drought and sea-level rise.

These actions are essential for slowing projected losses of carbon from forests, wetlands, and agricultural lands. BARCAP strategies in this sector go beyond protecting current lands, and advance approaches that can enhance carbon sequestration in plants and soils. Core actions to sequester more carbon and reduce on-farm energy emissions include:

- **Expanding urban green spaces and the urban canopy**, sequestering more carbon and cooling communities;
- **Implementing climate beneficial agriculture**, which increases soil organic matter and soil carbon, and can integrate carbon sequestering trees into row crops and grazing lands;
- **Reducing energy emissions from water pumping and irrigation and expanding renewables on suitable agricultural lands**, which expands the generation of zero-carbon electricity while reducing emissions from pumping and moving water, which takes up 12% of California's total energy use.[8]

Based on feedback from public engagement conducted during the development of the BARCAP, there is strong regional support for expanding and protecting green spaces and natural ecosystems (public survey results ranked this second among 13 potential focus areas for climate action). Public commenters also expressed support for measures that support biodiversity and agriculture worker welfare, youth and school involvement in nature-based solutions, and interest in incorporating nature-based solutions into future regional efforts to support a just transition. Members of the BARCAP region's frontline communities who participated in the BARCAP



The BARCAP focuses on accelerating implementation of nature-based solutions that both protect existing carbon stocks and increase carbon sequestration through new funding and technical assistance to the BARCAP region's rich network of implementers.

Key areas for action include policy and data innovation, conservation, wildfire risk reduction, ecosystem restoration, climate beneficial agriculture, and environmental justice-centric urban greening.

City of Oakland land back to the Lisjan (Ohlone) people: Rinihmu Pulte'irekne project

The City of Oakland worked with a local tribe and an Indigenous land trust to return 3.8 acres of land in a city park to Indigenous stewardship. Confederated Villages of Lisjan Nation (Lisjan) is a Bay Area tribe without federal recognition status. They work with Sogorea Te' Land Trust, an intertribal nonprofit organization to rematriate and access their ancestral land. Together with the City, a Cultural Conservation Easement was created to transfer stewardship of Rinihmu Pulte'irekne. While the City retains ownership and liability, all other rights, including monitoring and conservation were transferred to the land trust, with perpetual access rights for Lisjan people.

The Tribe led care of the land, incorporating traditional approaches to habitat restoration, including removal of invasive species, fire fuels reduction and the reintroduction of native plants.

Oakland is the first known city to return land back to a tribe without federal recognition status. Returning land to Indigenous stewardship is increasingly recognized as a key climate solution because of its potential to shift historical and environmental harms mitigating catastrophic climate events and impacts.

The Rinihmu Pulte'irekne project and strategy of a Cultural Conservation Easement offer a possible legal framework and model for other cities to replicate.[9]

engagement process expressed support for the creation of food-growing spaces, expansion of urban green spaces that beautify communities and reduce urban heat and flooding, restoring indigenous land ownership, access to nature, and desire for community-led land stewardship. At the same time, they were concerned that new green spaces might unintentionally cause gentrification and displacement, increase wildfire impacts, and reduce water availability.

Equity issues are interwoven throughout the sector. Urban areas affected by the legacy of discriminatory policies such as redlining face greater danger from urban heat and have fewer green spaces.[10] When green spaces are built in disinvested communities, they may factor into gentrification unless additional guardrails are in place.[11] Displacement of Native American Tribes from land, and historic criminalization of land management practices like cultural burning, have contributed to overstocked and unhealthy forests that are more prone to catastrophic wildfire.[12] Opportunities to interact and play in the Bay Area's natural spaces can be inequitable, running the risk of unequal access for Black, Indigenous, and People of Color (BIPOC) communities.[13] Finally, outdoor workers like firefighters and farmworkers are disproportionately exposed to climate impacts like extreme heat and wildfire smoke.[14] Real progress has been made across the BARCAP region to address these key environmental justice issues, led by implementers like community-based organizations, advocates, Native American Tribes, parks departments, and local governments. Equity-centered policy solutions, investments, and innovations woven throughout the BARCAP highlight where additional regional action can be taken to build upon this progress.

10.4 HOW MEASURES WERE DEVELOPED

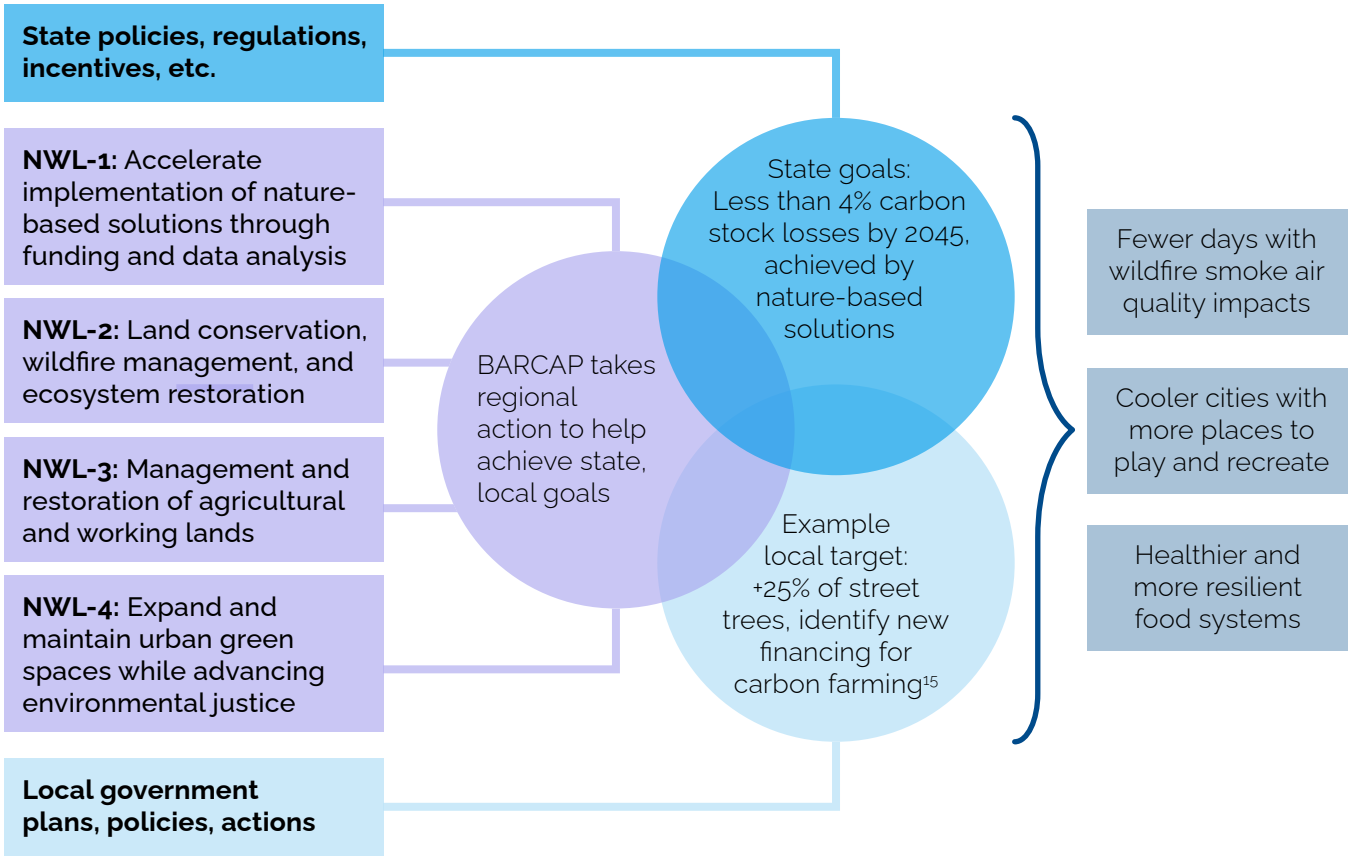
As described in Chapter 4, measures and actions were developed with extensive input from the public, frontline community members, and members of the NWL technical stakeholder working group. The technical stakeholder working group was comprised of 22 local experts in policy and implementation, who met, conferred, and advised over the course of six months in collaborative meetings to develop and refine the proposed measures and actions. Technical stakeholder working group members included resource conservation districts, implementers of urban forestry, regional conservation organizations, firewise councils, regional wetland protection organizations, local government staff involved in land management, and nonprofits with expertise in climate-beneficial agriculture. These technical experts grounded measures in the current assessment of implementation, key hurdles, and areas for action, and were foundational in shaping these measures.

The measures described on the following pages can be implemented with implementing partners' existing authorities.



10.5 NATURAL AND WORKING LANDS MEASURES AND ACTIONS

Figure 10-4: NWL measures contributing to state and local goals



The measures for the NWL sector contribute to achieving state and local goals for the sector and result in many other key benefits. As shown in Figure 10-4 they complement, rather than duplicate, state and local actions in important ways. The measures support successful local implementation of state policies and initiatives in ways that are equitable and bring many benefits to the BARCAP region. They also help remove barriers and build capacity to accelerate local action and scale promising approaches regionally.



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

GHG reductions in 2045:
Supporting

Potential regional benefits:
- \+ Reduced duplication of work and administrative burden
- \+ Increased implementer capacity
- \+ Integration of best available science and data

Design principles:

Climate resilience benefits: Improved data for climate resilience and mitigation crossover areas

Estimated costs of implementation:
NE

Proposed metrics: Number of data projects supported, usage of datasets by implementers, funding allocated to new nature-based solution implementation projects across the BARCAP region

SUMMARY

Accelerate implementation of nature-based solutions by providing land stewards and other implementers with regional-scale technical assistance for carbon data analysis and long-term funding and financing.

This will allow for more focus on-the-ground transformation of land management practices by reducing competition among implementers for funding or the need to conduct duplicative data analysis.

Milestones for Initiation:

Initiation dates assume funding and staff resources are available and obtained. If not, shifting initiation dates may be necessary.

- ★ **Q4 2026 –** Identify lead organization/ organization(s) to lead collaborative regional efforts
- ★ **2027 –** Launch new, or contribute significant resources to enhance existing regional data initiatives
- ★ **2027 –** Launch new, or contribute significant resources to enhance existing regional funding

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Community Engagement, Awareness, and Capacity

✚ Increased community capacity, awareness of solutions/projects and results, and trust between communities and the government

✖ *Potential low uptake of funding and technical assistance by smaller community-based organizations without specific outreach and partnership*

ACTIONS

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

Increase capacity for implementers of nature-based solutions to meet data tracking and inventory needs and reduce duplicative work across the BARCAP region by enhancing existing tools and resources, and/or providing technical assistance and standardization of regional approaches for analysis.

Implementation actions may include:

- **Obtain funding and/or provide professional expertise** to provide long-term maintenance of public data and technical assistance;
- **Create a public library for spatial and carbon sequestration datasets** and tracking metrics consistent with state analyses and latest science, include spatial data on equity, public health, and climate impacts;
- **Provide technical assistance to conduct standardized NWL carbon inventories** and landcover changes over time, including analysis of equity concerns to support implementation of nature-based solutions by local governments, resource conservation districts, community organizations, and other implementers.

Proposed Lead Implementer:
Regional agency or organization

Proposed Supporting Implementers:
Bay Area Greenprint, TOGETHER Bay Area, regional agency, San Francisco Estuary Institute (EcoAtlas), San Francisco Bay Joint Venture

Timeframe to start implementation:
Short-term

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

Support long-term implementation of nature-based solutions by obtaining regional-scale, transformative levels of funding. Implementation actions may include:

- **Offer grant writing assistance** to support nature-based solution implementation by multi-agency or organization coalitions including parks departments, local governments, open space districts, community-based organizations, nonprofits, resource conservation districts, and tribes;
- **Explore new long-term funding sources for nature-based solutions** including Proposition 4 and other state bonds, public banks, green banks, and market mechanisms;
- **Provide outreach to key environmental justice groups** to increase their knowledge and uptake of new regional supports.

Proposed Lead Implementer:
Regional agency or organization

Proposed Supporting Implementers:
Regional agency or organization, TOGETHER Bay Area

Timeframe to start implementation:
Short-term



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

GHG reductions in 2045:
High *(see Figure 10-4 for an illustration of the GHG emission reductions enabled by these measures and actions and Appendix C for quantified reductions)*

Potential regional benefits:

+ Biodiversity
+ Climate resilience
+ Outdoor access
+ Stewardship opportunities for frontline communities
+ Community health
+ Climate resilience
+ Green jobs
+ Access to services and amenities

Design principles:

Climate resilience benefits: Reduced wildfire severity, resilience to sea level rise and flooding

Estimated costs of implementation: **$$**

Proposed metrics: Number of new projects launched, acreage covered, funding provided, number of programs supporting implementation, changes in project-level carbon storage (if available)

SUMMARY

Prevent losses of carbon held in NWL from development and wildfire, while managing and restoring key carbon-rich lands to maximize carbon sequestration.

This measure addresses the challenge of predicted losses of carbon stocks which are expected statewide through the mid-century. Enhancing carbon sequestration and increasing carbon drawdown must build on a foundation of protecting existing pools of carbon held in regional natural and working lands.

Milestones for initiation:

Initiation dates assume funding and staff resources are available and obtained. If not, shifting initiation dates may be necessary.

- **Q3 2026 –** Continue to monitor and support existing programs across NWL-2
- **Q4 2026 –** Start pilot and private owner financing model innovation with existing funds
- **2027 –** Leverage Proposition 4 and Other Funding at Regional Scale
- **2027 –** Regional update on blue carbon and beneficial reuse linkage

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Public and Community Health

✚ Reduced exposure to wildfire smoke, increased access and community health benefits from access to natural spaces

✖ *Incentives for private owners of large land areas primarily benefit the wealthy*

Jobs and Workforce Development

✚ Post training employment and sustained work opportunities in land management and ecosystem restoration

✖ *Employment opportunities may not be sustained, well-paying or have benefits*

Climate Resilience Co-Benefits

✖ *Increased resiliency to climate-related impacts including wildfire, extreme heat, and sea level rise*

ACTIONS

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

Support regional implementation of California's 30 x 30 goals through conservation of NWL in the Bay Area region through the Priority Conservation Area (PCA) Program. Conservation priorities for protection and/or enhancement may be informed by emerging regional analysis on carbon stocks and sequestration, such as the 2022 carbon stock BARCAP inventory, and potential deliverables from NWL-1.1.

Proposed Lead Implementer:
MTC - PCA Grants Program, San Francisco Estuary Partnership

Timeframe to start implementation:
Short-term

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

Contribute to state targets for increased fuel management through treatments on NWL with high-fire risk. Treatments may include vegetation management, cultural and prescribed fire, and targeted grazing. Implementation actions to increase fuel management uptake may include:[16]

- **Exploration of new funding and financing strategies** to increase incentives for landowners to manage fuels, with a focus on smaller landowners and rural communities that may struggle to fund projects, including development of markets for woody material at high-fire risk, and climate co-benefit products like biochar;[17]
- **Identify and scale innovative and successful pilot projects** in fuel management;[18]
- **Reduce ignition risk in the WUI** by providing new incentives and exploring new policies to encourage homeowners to adopt home hardening practices, including "zone zero" practices that manage flammable materials within five feet of structures by managing flammable material;
- **Address the workforce gap for fuel management** through job training, emphasizing opportunities for indigenous land stewards and agricultural workers.

Proposed Lead Implementer:
Resource conservation districts (RCDs), fire safe councils, county governments (long-range planners), State agencies, Federal agencies, local fire protection districts

Proposed Supporting Implementers:
Community organizations, tribes, conservation corps, water agencies, local governments, University of California Cooperative Extension (UCCE)

Timeframe to start implementation:
Short-term/Medium-term



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

Overcome challenges for incentivizing private landowners to manage fuels on large land parcels through innovative financing mechanisms that allow for re-consideration of risks, pooling of costs, and benefits at the multi-parcel scale. This may include cost-sharing grants provided by local governments, existing regional cost-share programs (e.g. North Bay Forest Improvement Program), and emergent insurance-based mechanisms.

Proposed Lead Implementer:
RCDs, fire safe councils, county governments (long-range planners), State agencies, local fire protection districts

Proposed Supporting Implementers:
Community organizations, tribes, conservation corps, water agencies, local governments

Timeframe to start implementation:
Medium-term



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

Contribute to the achievement of targets from the 2022 San Francisco Estuary Blueprint Task 10, and Baylands Ecosystem Habitat Goals Science Update (2015):

- **23,000 acres of tidal marsh restored** in the Bay, and 5,500 acres of tidal marsh restored in the Delta, which is achieved through collaboration with diverse partners, and consideration of climate adaptation in project design;
- **3,000 acres of tidal marsh enhanced** in San Francisco Bay;
- **20,000 acres of Baylands protected** through various mechanisms including acquisition, transfer of fee title, or easement.

Implementation may depend upon funding availability.

Proposed Lead Implementer:
Nonprofits, government agencies, private entities, San Francisco Bay Joint Venture

Proposed Supporting Implementers:
Regional organizations for estuary partnership and restoration

Timeframe to start implementation:
Short-term



NWL-2.5: Contribute to emergent science on blue carbon through research on blue carbon fluxes and beneficial sediment reuse[19]

Monitor and research blue carbon fluxes – both sequestration and emissions – to inform wetland restoration and management, supporting San Francisco Estuary Partnership 2022 Blueprint Tasks 7-2 and 7-5.

Study and share knowledge on beneficial reuse of sediment for wetland restoration and adaptation – and how this can affect carbon sequestration.

Lead Implementers (Fluxes): State agencies, Federal agencies, and Universities

Proposed Supporting Implementers (Fluxes):
Delta Stewardship Council

Lead Implementers (Reuse): SF Estuary Institute/Regional Monitoring Program, federal implementing agencies

Proposed Supporting Implementers (Reuse):
Long Term Management Strategy Implementers (Federal agencies, regional commissions, State water agencies)

Timeframe to start implementation:
Short-term/Medium-term

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

Facilitate knowledge sharing about the carbon sequestration, wildfire mitigation, and climate resilience benefits of riparian protection and restoration.

Coordinate efforts to compile data and conduct monitoring on the rates of vegetation growth and carbon sequestration in riparian restoration under various conditions in the Bay Area.

Collaborate with stakeholders to leverage potential funding sources to achieve greater protection, restoration, and climate resilience of riparian areas.

Proposed Lead Implementer:
San Francisco Bay Regional Water Quality Control Board

Proposed Supporting Implementers:
Resource conservation districts (RCDs), nonprofits, community organizations, tribes, conservation corps, water and flood management agencies, Sonoma County Transportation and Climate Authorities (SCTCA), local governments

Timeframe to start implementation:
Short-term/Medium-term



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

GHG reductions in 2045:
Low *(see Figure 10-4 for an illustration of the GHG emission reductions enabled by these measures and actions and Appendix C for quantified reductions)*

Potential regional benefits:

+ Reduced water consumption
+ Community health
+ Climate resilience
+ Green jobs
+ Resilient food and fiber production
+ Renewable energy generation
+ Reduced worker exposure to toxins and pollution[21]

Design principles:

Climate resilience benefits: Increased resilience in agricultural practices that allow for greater preparedness for droughts, floods, and extreme weather

Estimated costs of implementation: $

Proposed metrics: Number of growers assisted, acreage applied, funding provided, number of programs supporting implementation, MW new renewable energy on agricultural lands, number of water projects implemented on farms, water savings (in terms of acre feet and/or percentage)

SUMMARY

Increase carbon draw-down into agricultural lands by scaling up climate beneficial agriculture and reducing implementation challenges, helping to achieve state and local governments' agricultural targets and goals.[20] Explore areas to increase cross-sector benefits and GHG emission reductions through energy-efficient sustainable water management and integration of renewable energy on agricultural lands.

This measure addresses implementation challenges and builds on existing opportunities to enhance and scale implementation of climate-beneficial agriculture practices.

Milestones for initiation:

Initiation dates assume funding and staff resources are available and obtained. If not, shifting initiation dates may be necessary.

- **Q2 2026 –** Continue to monitor and support existing programs across NWL-3
- **Q2 2026 –** Start funding search to enable NWL-3.2 and all connected actions
- **2027 –** Kickstart P-1 and connect convenings to NWL-3.4, NWL-3.5

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Jobs and Workforce Development

✚ Access to employment and sustained work opportunities once training is complete

✖ *Employment opportunities may not be sustained, well-paying or have benefits*

Community Engagement, Awareness, and Capacity

✚ Increased community capacity, awareness of solutions/projects and results, and 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*

Climate Resilience Co-Benefits

✚ Increased resiliency to climate-related impacts such as drought

ACTIONS

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

Implement scaled adoption of climate-beneficial agriculture practices including agroforestry, hedgerows, cover crops, conservation cover, windbreaks, compost application, riparian forest buffer, residue and tillage management, alternative manure management strategies, on-farm compost production, and critical area planting, contributing to state targets.

Support scaled adoption through actions including:

- **Increasing technical assistance** to support land managers plan, design, implement, and monitor multi-benefit climate-beneficial agriculture practices, with a particular focus on ensuring technical assistance access for small-scale and disadvantaged producers;
- **Strengthening education and partnerships** at the local and regional level to understand and overcome barriers to adoption;
- **Enhancing applied research** by supporting trials, research, and monitoring on working lands to refine local data and effectiveness of climate- beneficial practices;
- **Supporting development of key infrastructure** to reduce cost on the individual grower/organization and expand adoption of climate-beneficial practices, explore opportunities for local equipment and infrastructure sharing and improve access to plant materials and other supplies which may be supported through implementation of NWL-3.2;

- **Continuing to support urban and community-scale gardeners** and food growers to increase food sovereignty and urban agriculture as feasible;
- **Developing new equity-centric land access strategies** to increase access to agricultural lands, advancing environmental justice outcomes for disadvantaged producers, and new farmers and ranchers.

Proposed Lead Implementer:
Growers and land stewards, public and private landowners

Proposed Supporting Implementers:
RCDs, Carbon Cycle Institute, statewide farming organizations, UCCE

Timeframe to start implementation:
Short-term



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

Secure funding for and conduct a regional needs assessment. Implementation actions may include:

- **Identify gaps in existing locations** of staff and infrastructure (compost spreading equipment, nurseries) to support necessary investments, leveraging existing needs assessment work done by resource conservation district regional hubs;
- **Identify a portfolio of projects** that could be implemented within five years, including those that could be aggregated to achieve economies of scale and leverage funding, especially for multi-benefit projects;
- **Include specific analysis of needs and opportunities** for tribal, disadvantaged, and small-scale producers, which should be co-created with these implementers.

Proposed Lead Implementer:
RCDs, including Bay Area and North Coast Hub

Proposed Supporting Implementers:
Carbon Cycle Institute, UCCE, statewide farming organizations

Timeframe to start implementation:
Short-term



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

Support local, county, and regional governments in adopting strong agricultural climate solutions as part of future climate plans and policies by producing a toolkit on climate mitigation, co-benefits, resilience and adaptation impacts of climate beneficial agriculture. Implementation actions may include:

- **Update and finalize existing toolkit** developed by the Carbon Cycle Institute and partners;
- **Provide technical assistance** to government staff using toolkit to inform County climate action plan updates;
- **Work with counties to identify updates** to agriculture and working lands climate action plan chapters and targets;
- **Advocate for strengthening the integration of climate beneficial ("regenerative") agriculture** in the Priority Conservation Area Program lead by the Metropolitan Transportation Commission and funding priorities.

Proposed Lead Implementer:
Carbon Cycle Institute, county governments (climate, sustainability, planning staff)

Proposed Supporting Implementers:
RCDs, Air District, SCTCA, UCCE

Timeframe to start implementation:
Short-term

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

Explore areas where working lands can house and generate clean energy, including agrivoltaics, wind power, storage, and geothermal power resulting in a regional roadmap for renewable energy on agricultural lands to contribute to Measure P-1 in the Power Sector.

Implementation actions may include:

- **Mapping suitable sites,** establishing criteria for site suitability (e.g., presence of animal agriculture and existence of renewables like wind);
- **Identifying** financing models;
- **Pilot project identification** and opportunities for replication and expansion.

Proposed Lead Implementer:
Farmers, ranchers and growers, power providers

Proposed Supporting Implementers:
RCDs, research organizations, community organizations, local governments

Timeframe to start implementation:
Medium-term

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

Support higher rates of adoption for sustainable water management practices through promotion of best practices and technical assistance, contributing to energy efficiency targets for the BARCAP region.

Implementation actions may include:

- **Promote climate-friendly irrigation and stock watering practices** that increase water use efficiency and, where possible, recharge groundwater, including: solar-powered irrigation equipment, conversion to drip irrigation, winter stormwater capture, groundwater recharge basins, increasing soil organic matter and cropping system flexibility to maximize resilience to a changing climate;
- **Support farmers and ranchers in successful water management** through irrigation evaluations, permitting assistance, incentive program application assistance and whole-operation planning for improved water use efficiency, soil carbon enhancement, and climate benefits.

Lead Implementers: Regional water agencies, farmers, ranchers, and growers, RCDs, UCCE

Proposed Supporting Implementers: Groundwater sustainability agencies, local governments with groundwater resources, statewide farming organizations

Timeframe to start implementation: Short-term





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

GHG reductions in 2045: Medium *(see Figure 10-4 for an illustration of the GHG emission reductions enabled by these measures and actions and Appendix C for quantified reductions)*

Potential regional benefits:

+ Local food production
+ Community health
+ Climate resilience
+ Green jobs
+ Access to nature
+ Enhanced community engagement
+ Improve housing quality, comfort, and safety
+ Biodiversity

Design principles:

Climate resilience benefits: Reduced urban heat, increased opportunities for urban cooling and shade, equitable access to urban cooling, increased ability for urban landscapes to withstand damage from floods and extreme weather

Estimated costs of implementation: $$$

Proposed metrics: Percent urban canopy increase, funding invested in urban greening, number of new urban green spaces, number of new programs and supports for operations and maintenance

SUMMARY

Increase carbon stored in urban plants and soils through expansion and maintenance of green spaces that reduce the effects of flooding and extreme heat, build food sovereignty, and beautify and connect communities. Achieve these outcomes through new regional funding, staffing, and technical assistance resources. Ensure that frontline communities benefit from urban green spaces and avoid unintended consequences by supporting a policy shift towards community-led planning to embed environmental justice and anti-gentrification approaches in urban greening.

This measure addresses the challenge of current gaps in the funding and implementation landscape to support long-term operations and maintenance issues faced by urban greening implementers. It also addresses challenges linked to gentrification and displacement in relation to urban greening through community planning, empowerment, and policy innovation.

Milestones for initiation:

Initiation dates assume funding and staff resources are available and obtained. If not, shifting initiation dates may be necessary.

- **Q3 2026 –** Continue to monitor and support existing programs across NWL-4
- **Q3 2026 –** Start funding search to enable NWL-4.1 and NWL-4.2
- **Q3 2026 –** Plan for regional convening to support NWL-4.1 and NWL-4.2

✚ = Potential Benefits
✖ = *Potential Unintended Consequences*

FRONTLINE COMMUNITY IMPACTS:

Housing Quality and Security

✚ Improved housing conditions, increased comfort, protection from extreme heat

✖ *Potential for increased housing costs, displacement risk and rent increases unless protections are provided*

Public and Community Health

✚ Reduced exposure to health-damaging pollution, improved food access, and reduced heat island effect from new green spaces and community gardens

✖ *Potential inequitable access to health benefits if communities are left out of the planning process and/or greening sites are not accessible to community members*

Jobs and Workforce Development

✚ Access to employment and sustained work opportunities once training is complete

✖ *Employment opportunities may not be sustained, well-paying or have benefits*

Community Engagement, Awareness, and Capacity

✚ Increased community capacity, awareness of solutions/projects and results, and 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*

Climate Resilience Co-Benefits

✚ Increased resiliency to climate-related impacts, including flooding and extreme heat

✖ *Potential inequitable access to climate resilience benefits if communities are left out of the process and or greening sites are not accessible to community members*

Cost Burden

✚ Potential decreased energy cost burden from reduced need for air conditioning due to cooling effects of greening

✖ *Potential inequitable access to cooling and reduced energy costs if greening sites are not adjacent to communities*

ACTIONS

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

Contribute to state and local goals for urban forestry investment and drought resistant watering. Green spaces that may garner particular focus because of air quality, environmental justice, or climate resilience benefits include parks and trees in formerly redlined or under-greened communities, community farms and gardens, freight corridor buffers, and green stormwater infrastructure. Implementation actions may include:

- **Increase funding through new regional-scale funding sources** such as Proposition 4/ state bonds, which may be provided to coalitions of local governments/implementers for urban greening implementation;
- **Increase technical assistance, funding, and long-term maintenance support** for urban green spaces by providing tree inventories, and hands-on arborist support to local governments and other implementers at the regional scale;
- **Identify, support, and scale pilot projects** for emergent or difficult to implement urban green spaces like green buffer zones along freight corridors and urban agriculture;
- **Explore opportunities to integrate green spaces** into transportation, active transportation, transit, and road infrastructure upgrades;
- **Regularly convene local governments and other implementers** to understand and overcome barriers to implementing "right tree right place" urban greening, allowing for iterative and targeted future technical assistance;
- **Dedicate regional staff time and expertise to help local governments** integrate best practices into urban greening by providing policy resources, research, and case study support that will aid implementers in achieving urban greening goals.

Proposed Lead Implementer:
Regional agencies, local governments, community organizations, parks departments, public works, urban farms and gardens, SCTCA, UCCE

Proposed Supporting Implementers:
State agencies, Bay Area Regional Collaborative (BARC), water agencies, San Francisco Estuary Institute [Urban Nature Program]

Timeframe to start implementation:
Short-term

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

Implementation might consist of regional support to local governments and other implementers for policy and plan updates and to frontline community-lead stewardship for capacity building, including:

- **Provide local governments and community organizations with a best practices policy toolkit,** including emergent projects across the BARCAP region, for environmental justice approaches including case studies, and local examples that embody community-led planning and outcomes for equitable urban greening that avoid unintended gentrification consequences;
- **Develop and share best practices on air quality and urban greening intersection-** facilitate establishment of low volatile organic compound (VOC)-emitting native new trees through exploration of resources and best available research on community health and air quality benefits of urban greening, amplifying similar work being done at Sacramento Metropolitan Air Quality Management District;
- **Advocate for a regional shift towards community-led planning in urban greening** by encouraging new urban greening projects to include frontline community members and community-based organizations early, and often in planning stages to guard against gentrification, space conflict, and other unintended harms of urban greening, explore collaboration points with AB 617 community emission reduction plans;
- **Provide financial and technical assistance** for local planners to identify and collaborate with trusted messengers and community organizations to deliver multilingual, culturally relevant urban greening outreach;
- **Seek additional technical and financial support opportunities** to build long-term land stewardship capacity among frontline communities through education programming, exploration of community ownership models, and job training to implement urban greening.

Proposed Lead Implementer:
Regional agency, local governments (planning), community organizations

Proposed Supporting Implementers:
Community members, conservation corps, nonprofits, Air District, schools and youth organizations

Timeframe to start implementation:
Short-term



10.6 FUNDING IMPLEMENTATION

Implementation of the NWL sector measures can be supported in part through existing funding and financing approaches. For example, both California Natural Resources Agency's Urban Greening Program and CAL FIRE's Urban and Community Forestry Grant provide funding for green infrastructure and urban forest management. Additionally, CAL FIRE's Forest Health Grants and California Forest Improvement Program provide funding for forest improvement, restoration, and fuels reduction.[22] The US Department of Agriculture's Environmental Quality Incentives Program (EQUIP) also provides financial assistance for agricultural producers to apply conservation practices that conserve resources and mitigate climate risks. RCDs, who are instrumental in enacting NWL climate actions at the county-level do not have guaranteed funding, and have historically relied on state and federal funding, including EQUIP on a project-by-project implementation basis.[23] Voters in California are increasingly recognizing the importance of nature-based solutions, with the 2024 passage of Proposition 4 dedicating $10 billion to wildfire resilience, protecting drinking water, and other climate actions.[24] The programs listed above are not a comprehensive list of available funding. See Appendix G for other funding and financing sources, programs and partners, and examples of successful implementation. Additional funding and financing mechanisms will be needed to fully achieve the goals of this sector.

ENDNOTES

1 While carbon stocks and carbon sinks are oftentimes used interchangeably, carbon stocks in the context of the BARCAP carbon stock inventory specifically refer to the amount of carbon held in a carbon pool, or stock, such as soil organic carbon or forest biomass. Carbon sinks, as described further in footnote two, refer more specifically to the process of carbon drawdown, or movement of carbon from the atmosphere into natural carbon pools; "Carbon Stocks, Fluxes and the Land Sector," Forest Carbon and Climate Program, Michigan State University, February 7, 2022, https://www.canr.msu.edu/news/carbon-fluxes-and-carbon-stocks.

2 Carbon sinks describe the role of plants and soils to sequester carbon by capturing carbon dioxide from the atmosphere and transform it into biomass and soil organic matter, where it is stored for long periods of time. When more carbon is drawn down than these natural carbon cycles emit, these reservoirs of carbon in plants, oceans, and soils are called carbon sinks because they are net sinks, not net emitters; "Soil-Based Carbon Sequestration," MIT Climate Portal, accessed October 28, 2025, https://climate.mit.edu/explainers/soil-based-carbon-sequestration; "Carbon Sinks and Sequestration," United Nations, Accessed October 28, 2025, https://unece.org/forests/carbon-sinks-and-sequestration.

3 The US Environmental Protection Agency's Greenhouse Gas Equivalencies Calculator was used to convert carbon held in NWL to carbon dioxide equivalent (CO_2-e) units in order to make this comparison; "EPA Greenhouse Gas Equivalencies Calculator," United States Environmental Protection Agency, Accessed October 28, 2025, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

4 "Appendix I – Natural and Working Lands Technical Support Document," in 2022 Scoping Plan for Achieving Carbon Neutrality, California Air Resources Board, Accessed October 28, 2025, https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-appendix-i-nwl-modeling.pdf.

5 "30X30 Conserved Areas, Terrestrial (2024)," California Open Data Portal, California Natural Resources Agency, Accessed October 28, 2025, https://data.ca.gov/dataset/30x30-conserved-areas-terrestrial-2024; "Project Map," Resource Conservation District Project Tracker, Accessed October 28, 2025, https://www.rcdprojects.org/Results/ProjectMap.; "Interagency Tracking System," California Wildfire and Forest Resilience Task Force, Accessed October 28, 2025, https://interagencytrackingsystem.org/; "Restore Our Wetlands," Save The Bay, Accessed March 6, 2025, https://savesfbay.org/restore/.

6 "The Carbonizer- Groundbreaking Technology Being Used to Reduce Wildfire Risk," East Bay Regional Park District, December 21, 2023, https://www.ebparks.org/about-us/whats-new/news/carbonizer; "Thinking Outside the Box: Leading the Way on Wildfire Protection or the Community," East Bay Regional Park District, December 7, 2023. https://www.ebparks.org/carbonizer.

7 CARB targets reflect: California Natural Resources Agency, California Air Resources Board, California Environmental Protection Agency, and California Department of Food and Agriculture; "California's Nature-Based Solutions Climate Targets," California Natural Resources Agency, April 22, 2024, https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Expanding-Nature-Based-Solutions/Californias-NBS-Climate-Targets-2024.pdf.

8 "Water Energy Nexus," California Department of Water Resources, Accessed October 28, 2025, https://water.ca.gov/Programs/All-Programs/Climate-Change-Program/Water-Energy-Nexus.

9 "Rematriation at Rinihmu Pulte'irekne," U.S. Fish and Wildlife Service, Accessed October 28, 2025, https://

www.fws.gov/project/rematriation-rinihmu-pulteirekne; "Rinihmu Pulte'irekne (Sequoia Point)," Sogorea Te' Land Trust, Accessed October 28, 2025, https://sogoreate-landtrust.org/sequoia-point-land-return/.

10 "50 Years after Being Outlawed, Redlining Still Drives Neighborhood Health Inequities," University of California Berkeley Public Health, May 20, 2025, https://publichealth.berkeley.edu/articles/spotlight/research/50-years-after-being-outlawed-redlining-still-drives-neighborhood-health-inequities#:~:text=Access%20to%20parks%2C%20trees%2C%20and,from%20the%20Mapping%20Inequality%20Project.

11 Isabelle Anguelovski et al., "Green gentrification in European and North American cities," Nature communications 13, no. 1 (2022): 3816.

12 Robyn Schelenz and Jessica Wheelock, "How the Indigenous Practice of 'good Fire' Can Help Our Forests Thrive," University of California, May 31, 2024, https://www.universityofcalifornia.edu/news/how-indigenous-practice-good-fire-can-help-our-forests-thrive.; Deniss J. Martinez et al., "Indigenous fire futures: anticolonial approaches to shifting fire relations in California," Environment and Society 14, no. 1 (2023): 142-161.

13 Emma Stuck, "Nature Gap: Why Outdoor Spaces Lack Diversity and Inclusion," North Carolina State University- College of Natural Resources News, December 14, 2020, https://cnr.ncsu.edu/news/2020/12/outdoor-diversity-inclusion/.; "Outdoors for All – Providing Equitable Access to Parks and Nature," California Natural Resources Agency, November 2023, https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Access-for-all/Outdoors_for_All_Strategy_English.pdf.

14 Janet Byron, "Protecting Farmworkers from the Health Impacts of Climate Change," University of California Santa Cruz, November 7, 2024, https://farmworkerhealth.ucsc.edu/news/2024/11/protecting-farmworkers-from-health-impacts-of-climate-change/.

15 City and County of San Francisco, "San Francisco's Climate Action Plan 2021," City and County of San Francisco, 2021, https://www.sfenvironment.org/media/14441; "Working Lands Protecting our resources for future generations." San Mateo County Sustainability Department, Accessed September 26, 2025, https://www.smcsustainability.org/greenhouse-gas-reduction/ccap/working-lands/#policy-l-1:-identify-new-financing-to-scale-carbon-farming.

16 Wood chipping specifically refers to fire-at-risk wood and vegetation, rather than production and processing of woody biomass for fuel.

17 'Fire-at-risk' wood refers to woody biomass classified as Very High, or High Fire Hazard Severity under agencies like CALFire; "Fire Hazard Severity Zones," California Office of the State Fire Marshal, Accessed October 28, 2025, https://osfm.fire.ca.gov/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones; Biochar created via pyrolysis or gasification is subject to Air District permitting.

18 Strategies like prescribed fire require a submittal of a Smoke Management Plan to the Air District under Air District Regulation 5: Open Burning (Regulation 5). As of October 2025, the Air District adopted amendments to Regulation 5 to waive operation fees for all persons conducting prescribed burns, expanding the previous exemption that applied only to public agencies. The amendments to Regulation 5 support statewide efforts to expand beneficial fire practices for wildfire prevention and land stewardship.

19 The National Oceanic and Atmospheric Administration defines blue carbon as "carbon dioxide that is absorbed from the atmosphere and stored in the ocean…underwater sediments, coastal vegetation and soils; carbon-containing molecules such as DNA and proteins; and ocean life from whales to phytoplankton." Michon

Scott and Rebecca Lindsey, "Understanding blue carbon," National Oceanic and Atmospheric Administration, Archived June 25, 2025, https://www.climate.gov/news-features/understanding-climate/understanding-blue-carbon#:~:text=Blue%20carbon%20refers%20to%20carbon,than%20even%20a%20tropical%20rainforest.

20 Climate beneficial agriculture is the term preferred by implementing partners at Carbon Cycle Institute and Bay Area resource conservation districts (RCDs) and can also be described interchangeably as 'carbon farming', 'climate-smart agriculture' and 'regenerative agriculture'. Climate beneficial agriculture, as articulated by the California Department of Food and Agriculture's 2025 definition of regenerative agriculture describes an integrated approach to farming and ranching rooted in principles of soil health, biodiversity and ecosystem resiliency leading to improved targeted outcomes; "RCD Regional Ag and Climate Hub Coordinators," California Association of Resource Conservation Districts, Accessed October 28, 2025, https://carcd.org/page/rcd-regional-ag-and-climate-hubs; "Defining Regenerative Agriculture for State Policies and Programs," California Department of Food and Agriculture, Accessed October 28, 2025, https://www.cdfa.ca.gov/RegenerativeAg/.

21 Shifts to climate-beneficial agriculture that reduce reliance on synthetic fertilizers, pesticides, and herbicides may improve farmworker health through reduced exposure.

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11 Industrial Sector

11.1 Sector overview

11.2 Context

11.3 Supporting action in the industrial sector





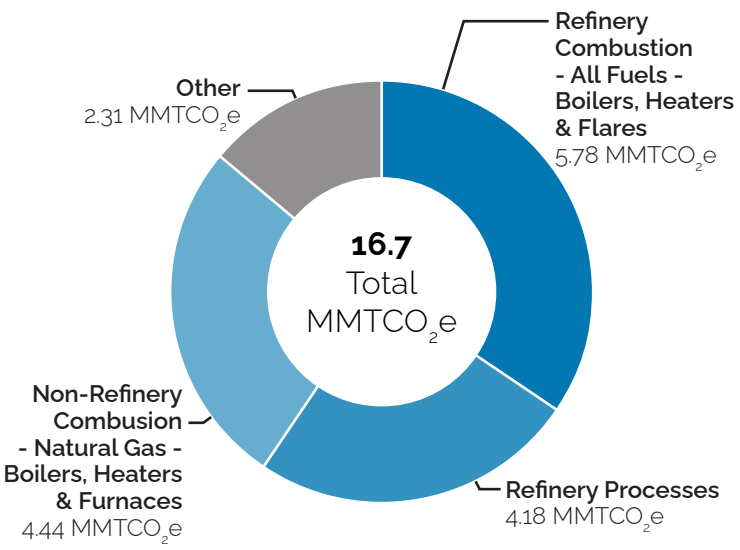
11 Industrial Sector

11.1 SECTOR OVERVIEW

The industrial sector includes activities related to the manufacturing and processing of goods and raw materials. The sector includes businesses and operations that produce fuels, machinery, motor vehicles and aircraft, electronics, furniture, and clothing. It also includes construction equipment.

The industrial sector is the second largest source of greenhouse gas (GHG) emissions in the Bay Area Regional Climate Action Plan (BARCAP) region. In 2022, the industrial sector accounted for 31% of GHG emissions in the BARCAP region (16.7 million metric tons of carbon dioxide equivalent ($MMTCO_2e$)) (see Figure 11-1). Generally, emissions from this sector come from fuel combustion at facilities (70%) (e.g., burning natural gas at power plants, refineries, factories, or other industrial facilities). Processes (e.g., chemical reactions in metal, cement, mineral and fuel production) account for 26% of sector emissions, while fugitive/evaporative emissions (e.g., from industrial processes, equipment, oil and gas systems) and leaks of high-global warming potential (GWP) gases) accounted for 4% of industrial emissions.

Figure 11-1: GHG emissions by industrial sub-sector for BARCAP region in 2022



In 2022, the refining of fuel for the transportation sector accounted for 60% of the industrial sector's emissions (10 $MMTCO_2e$). These emissions are associated with the transportation sector when accounting for all transportation-related emissions. Chapter 2.1.3 and Appendix A describe the contribution of emissions from the refining of transportation fuels in more detail. Another significant emissions source in the industrial sector was combustion of natural gas in boilers, heaters, furnaces, ovens, and afterburners for industrial uses at facilities other than refineries, which accounted for 27% (or 4.4 $MMTCO_2e$) in 2022. The GHG emissions from the industrial sector in the BARCAP region are roughly similar in 2022 to emission levels in 1990.

11.2 CONTEXT

Current state law prohibits local air districts from regulating carbon dioxide (CO_2) emissions from sources covered by the state's Cap-and-Invest regulation. The vast majority of the BARCAP region's industrial sector GHG emissions (85%) are covered by Cap-and-Invest. The BARCAP therefore does not include new measures or actions to reduce CO_2 from these covered sources. Section 11.2.1 below describes different approaches the Air District has taken to address GHG emissions from the industrial sector.

11.2.1 History of Air District GHG reduction actions for industrial sector

The Air District regulates air pollutant emissions at large industrial sources such as refineries. Regulation of GHG emissions from these sources, however, has been complex and has changed over time. As part of implementation of the 2017 Clean Air Plan, the Air District initiated a region-wide strategy to systematically address emissions, including GHG emissions, from stationary fossil fuel combustion, beginning with the three largest industrial sources: petroleum refineries, power plants, and cement plants.[1] As a first step, the Air District began developing two rules to address refinery emissions. The first proposed rule, Regulation 12, Rule 16: Petroleum Refining Greenhouse Gas Emissions Limits, sought to place a numeric cap on GHG emissions at refineries.[2] The second rule, Regulation 13, Rule 1: Petroleum Refinery Carbon Intensity Limits, proposed limiting

refining carbon intensity[3] to a level consistent with each refinery's current operations. It aimed to complement and serve as a backstop for state climate efforts, which, at the time, were expected to require refinery carbon intensity reductions equivalent to a 20% reduction in GHG emissions by 2030.[4] The Air District held public workshops on both rules and was poised to present draft Rule 12-16 to the Board of Directors for adoption in Summer 2017. However, the state's Cap-and-Invest program was extended with the passage of Assembly Bill 398 (2017), and the Air District lost its authority to regulate CO_2 emissions from large industrial sources. As a direct result, the Air District suspended further action on these rule development efforts.

After losing the authority to regulate CO_2 from most industrial sources, the Air District shifted its focus to the second largest climate pollutant, methane. Initial success came with the adoption of the first methane rule: Rule 13-5: Industrial Hydrogen Plants, adopted in May 2022.[5] This rule limits vented emissions of methane and organic compounds (precursors to smog formation) from hydrogen production plants and hydrogen carrying systems. The rule reduces methane emissions from hydrogen production plants by at least 90% - a reduction of 78,000 $MTCO_2e$ annually in a typical year.

11.3 SUPPORTING ACTION IN THE INDUSTRIAL SECTOR

While the BARCAP does not include measures and actions to address industrial GHG emissions, the Air District is helping to advance California's climate goals by supporting important state policies for this sector. The most significant policy for the industrial sector is the California Air Resources Board's (CARB's) Cap-and-Invest program, which is the state's chief mechanism for reducing CO_2 emissions in the industrial sector. CARB is also implementing a Short-Lived Climate Pollutant (SLCP) Reduction Strategy (required by Senate Bill 1383).[6] Below is a discussion of these policies and Air District actions to support them.



11.3.1 Cap-and-Invest Program

The Cap-and-Invest Program is the state's main policy mechanism to reduce CO_2 emissions from the industrial sector, and the Air District is prohibited from regulating CO_2 emissions from sources covered by the program. Within the BARCAP region, emissions from industrial facilities that are not covered by the Cap-and-Invest Program totaled 0.44 $MMTCO_2e$ in 2022, just 3% of total BARCAP industrial emissions. Roughly a third of industrial GHG emissions from non-Cap-and-Invest sources are from natural gas combustion in boilers and heaters.

Air District support:

- The Air District's Strategic Plan commits the agency to maximize the climate change benefits of its regulations and nonregulatory programs. This includes a loan guarantee program to support commercialization of technologies, which can increase industrial efficiency and/or promote decarbonization.

11.3.2 Short-lived climate pollutants

The SLCP Strategy is California's plan for reducing emissions of high GWP gases with short atmospheric lifetimes. Short-lived climate pollutants include the GHGs methane and hydrofluorocarbons (HFC are high GWP gases mostly used in refrigeration, aerosols, fire protection, and solvents), as well as black carbon. The SLCP Strategy includes goals of reducing methane and HFC emissions each by 40% below 2013 levels by 2030. This Strategy sets a target for human-produced black carbon emissions (or soot, which is a dominant component of diesel particulate matter) to decrease by 50% from 2013 levels by 2030.[7]

Air District support:

- The Air District is investigating possible rule amendments to reduce methane emissions from refineries.



ENDNOTES

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2 "Regulation 12 Rule 16: Petroleum Refining Greenhouse Gas Emissions Limits," Bay Area Air District, Accessed October 21, 2025, https://www.baaqmd.gov/rules-and-compliance/rules/regulation-12-rule-16-petroleum-refining-greenhouse-gas-emissions-limits?sc_lang=en&switch_lang=true.

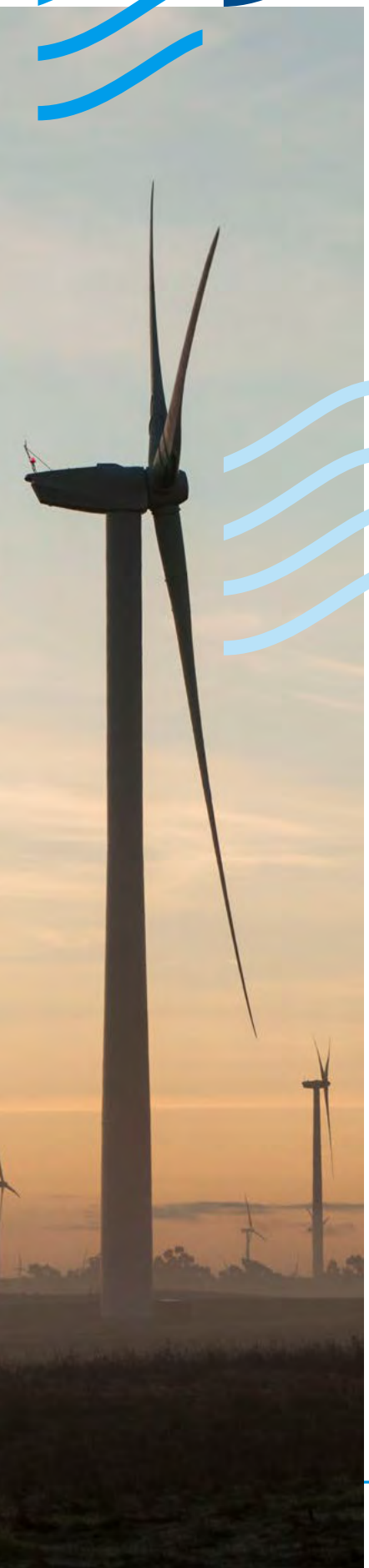
3 Carbon intensity is the amount of GHG emissions per unit of total oil feedstock (crude plus non-crude) processed (thousands of barrels) and can be an indication of the energy and process efficiency of a refinery when compared to similar facilities. "DRAFT Regulation 13 Climate Change Pollutants Rule 1 Petroleum Refining Carbon Intensity Limits or Facility-wide GHG Emission Limits", Bay Area Air District, March 21, 2027, https://www.baaqmd.gov/~/media/files/planning-and-research/rules-and-regs/workshops/2017/reg-13-rule-1/draft-rg1301.pdf?rev=a4d538b872bd427bb27bd7c69a74c2b8&sc_lang=en.

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6 "Short-Lived Climate Pollutant Reduction Strategy," California Air Resources Board, March 2017, https://ww2.arb.ca.gov/resources/documents/slcp-strategy-final?keywords=2025.

7 See California Air Resources Board's Short-Lived Climate Pollutant Reduction Strategy (2017) for more discussion and a definition of black carbon.



12 Implementing the BARCAP

Successful and thoughtful implementation is critical to realizing the greenhouse gas (GHG) emission reductions and other core benefits from the Bay Area Regional Climate Action Plan (BARCAP) measures. This requires collaboration across many agencies and organizations, accountability through tracking and reporting, and the necessary workforce, funding, and financing to execute the plan.

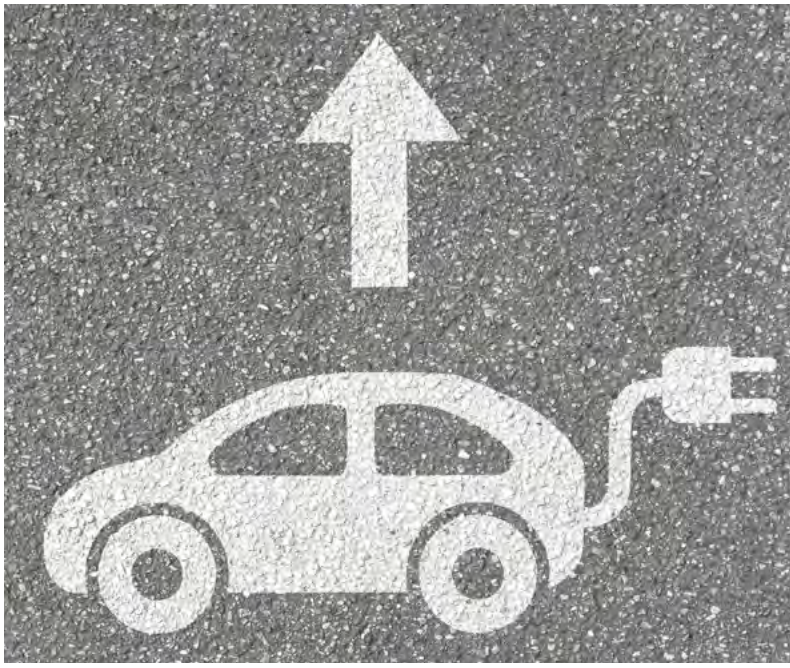
12.1 COLLABORATIVE PROCESS

While the Air District played the lead role in coordinating plan development, it will be only one of many key agencies and organizations that together implement this plan. The scope of the BARCAP, which covers eight counties and five economic sectors, requires a broad coalition of agencies and organizations with different authorities, expertise, and networks including regional agencies, city and county governments, utilities and community choice aggregators, resource conservation districts, business networks, community-based organizations (CBOs), and others. Implementing the BARCAP will require the same high degree of collaboration that was used to develop the plan.

12.1.1 Implementation partners and details

The BARCAP identifies a variety of lead and supporting implementers for each action in the plan. Lead implementers are agencies or organizations that would coordinate or manage the overall implementation of an action. In some cases, they would lead one or more core components of an action. Supporting implementers would participate in implementation of an action but would not take a leading role. For most actions, the lead and supporting implementers are known. However, for several actions – particularly those with longer timelines to begin implementation – conversations to identify key implementers are ongoing are will be identified as the details of implementation are more fully

developed.



Many actions already include specific information on how they will be implemented. For others, details such as specific implementing partners and their roles, programmatic components, equitable outreach and engagement, etc., will be determined during the early stages of the implementation process. Many helpful comments were made during the public review of the draft BARCAP measures that will be considered during the early implementation stage. Many public comments received online and in workshops offered useful information and detailed suggestions for the implementation phase. Comments included specific organizations and existing resources to leverage, ways to involve and further expand opportunities for different types of contractors, and potential funding sources to explore to provide financial support. Across sectors, for many actions, the first implementation steps will include convening conversations to discuss the implementation approach, including funding sources.

12.1.2 The Air District's role

While implementation of the BARCAP will be a collaborative process, the Air District will play a central role in tracking the implementation of BARCAP measures, tracking progress on implementation milestones and metrics, and reporting on the status of implementation to partners and the public. The Air District will also serve as a lead or supporting implementer for several BARCAP measures and actions and may play a convening role in some instances.

12.2 IMPLEMENTATION TIMELINE

Nearly all BARCAP actions are designed so that implementation of all or part of the action can begin in the short- to medium-term timeframes. A short-term timeframe means that implementation can be initiated within two years from when the BARCAP is finalized, and medium-term would begin within two to five years. Long-term refers to implementation beginning after five years. Chapters 6 to 10 provide more information on the timing for specific BARCAP actions. The timeframes assume that funding and staff resources are available and obtained. If staff capacity and funding resources are not secured, shifting the estimated initiation dates may be necessary.

12.3 FUNDING

Changes in funding priorities at the federal level have introduced uncertainty regarding the future of funding for climate programs and initiatives. Without reliable federal funding sources, state and local resources and existing and innovative new funding and financing approaches will become even more critical for BARCAP implementation.

Several BARCAP actions directly address the need for additional funding by leveraging existing funding streams, identifying and securing new funding sources, and adjusting existing funding to better support frontline communities. These actions include:

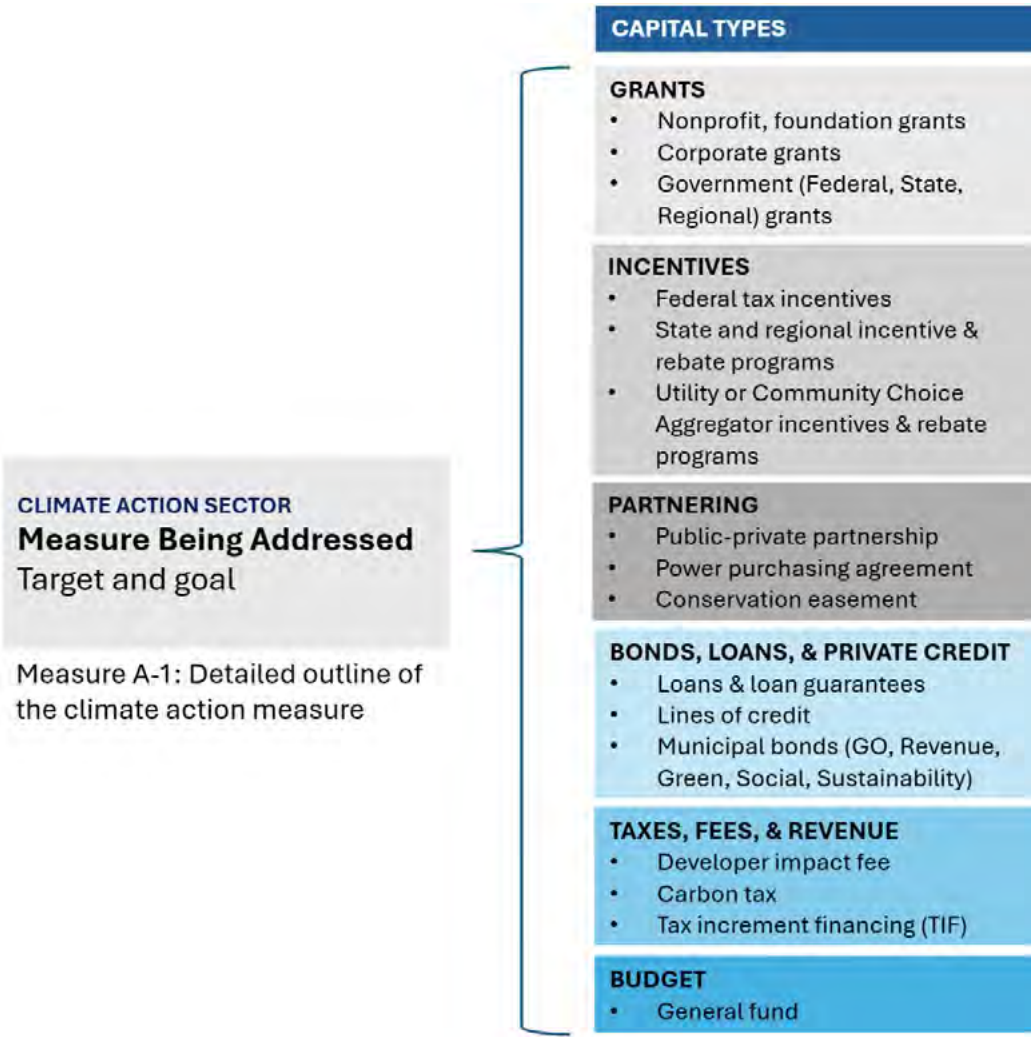
T-1.1: Expand incentives for the purchase or lease of EVs
T-1.2: Provide monetary and non-monetary incentives to deploy EV charging stations at strategic locations to help fill gaps in the existing charging network
T-2.1: Expand incentives and loan assistance for the purchase of medium- and heavy-duty zero-emission (ZE) vehicles and equipment
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-2.1: Explore new funding and financing opportunities for home repair, public health, energy efficiency, and decarbonization programs to augment existing sources
B-3.2: Explore 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
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
W-1.1: Develop funding and asset-sharing mechanisms to support edible food recovery
NWL-1.2: Increase long-term funding for nature-based solutions through dedicated support for regional-scale grant writing and exploration of sources of long-term funding
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
NWL-2.3: Incentivize private landowners managing large land areas to manage fuel at scale through innovations in cost sharing and financing

12.3.1 Leveraging existing funding sources

State agencies, such as the California Energy Commission (CEC), California Public Utilities Commission, California Natural Resources Agency and CalRecycle, and regional programs implemented by utilities and Regional Energy Networks (funded by ratepayers) provide a variety of funding mechanisms including grants, rebates, low-interest loans, and other incentives. Regional agencies, like the Air District provide financial incentives to advance climate and clean energy solutions. It will be critical to prioritize funding for implementing actions that benefit frontline communities and ensure these communities have access to funding and financing opportunities.

The roadmap below (Figure 12-1) draws from many sources to provide an approach to funding and financing implementation of BARCAP measures.[1] It includes grants, loans, vouchers, rebates and other mechanisms as possible sources of funds. It includes examples of existing case studies from within the BARCAP region and California, as well as innovative approaches from elsewhere in the United States.

Figure 12-1: HIP plan-level funding map



Detailed funding roadmaps for specific BARCAP measures are included in Appendix G.

12.3.2 Identifying and developing new funding sources

Additional funding and financing will be needed to fully implement all BARCAP measures, even after taking advantage of all the programs described above. The BARCAP region and state are facing an affordability crisis, which means funding is needed to not just implement the measures but to do it in a way that does not further impact affordability. Along with the state, the Bay Area region must find or create new funding and financing mechanisms to backstop the decrease in federal funding and increase the total overall financial resources supporting climate action, particularly in frontline communities. This will require collaborative and creative thinking, and drawing on innovative examples including public-private partnerships such as city-business climate alliances, utilizing strategic financing mechanisms such as on-bill financing, partnering with philanthropic organizations, the business community, creating land-based financing such as special districts, etc.

12.4 TRACKING AND REPORTING

The Air District will play a central role in tracking overall implementation of the BARCAP and tracking progress. This will involve regularly conferring with the lead implementers of each action to assess implementation progress.

Metrics for tracking progress have been identified for each BARCAP measure and are included in the measure descriptions in Chapters 6 to 10. These metrics are indicators of progress towards key desired outcomes of measures. The Air District will work with implementation partners to determine the most appropriate metrics from these lists to track progress and then work together to compile and periodically report on the status of implementation.

As part of its grant obligation to the U.S. Environmental Protection Agency, the Air District will submit a report on the status of BARCAP implementation in the summer of 2027.

12.5 CONSIDERATIONS FOR IMPLEMENTATION

The public and community engagement processes and the workforce planning and frontline communities impact analysis raised several important considerations for how to implement the BARCAP. The following issues should be thoughtfully considered and incorporated into implementation of the BARCAP measures to ensure the measures achieve their intended goals.

12.5.1 Workforce

Implementation of the BARCAP provides an opportunity for the BARCAP region to create additional high-quality jobs.[2] While some BARCAP measures explicitly address workforce needs, efforts to grow the qualified, trained workforce necessary to implement the BARCAP over the coming decades are needed across all sectors. This requires a commitment to partnering and investing in workforce development and providing work opportunities and pathways to residents in the BARCAP region, including frontline communities.

A workforce planning analysis of the BARCAP measures found that each sector will need to grow its trained workforce in the key occupations listed below, and by varying magnitudes depending on the measures.[3] Many of these occupations pay more than the regional median wage ($33.93 per hour).



Buildings: carpenters; construction laborers; electricians; plumbers, pipefitters, and steamfitters; and HVAC mechanics and installers

Natural and Working Lands: farmworkers and laborers: crop, nursery, and greenhouse workers; firefighters; farmers, ranchers, and other agricultural managers; environmental scientists and specialists; tree trimmers and pruners; urban and regional planners; forest and conservation technicians; conservation scientists; foresters; agricultural engineers; and forest fire inspectors and prevention specialists

Power: electrical, electronic, and electromechanical equipment assemblers; electrical engineers, power-line installers and repairers; solar photovoltaic installers; power plant operators; and wind turbine service technicians

Transportation: retail salespersons; electricians; automotive service mechanics; and electrical and electronics installers and repairers

Waste: refuse and recyclable materials collectors; light-duty truck drivers; heavy-duty and tractor-trailer truck drivers; operating engineers and other construction equipment operators; mobile heavy-duty equipment mechanics; hazardous materials removal workers; and shipping, receiving, and inventory clerks

In many cases, the BARCAP region's current workforce has the necessary skills, while in a few instances, such as plumbers (who may need training for installing heat pump water heaters, which run on electricity instead of gas), upskilling may be necessary. Fortunately, the Bay Area is home to a robust network of training programs and resources that can support workers in this transition.

The accessibility of these roles and training opportunities, however, may not be equal for everyone. Job seekers residing in frontline communities may also require additional resources, such as childcare, transportation assistance, interpretation and translation, and other services to overcome systemic barriers to participation in certification and training programs and securing high-quality employment.

For a detailed analysis of the current and future state of the Bay Area workforce, critical occupations for successful implementation of the measures, and existing training opportunities, see Appendix F.

The workforce planning analysis also identified core recommendations that should be considered when implementing the measures that extend across all five sectors, including:

- Greater K-16 education communication and awareness of careers related to implementing the BARCAP;
- Coordination with community colleges, vocational and technical schools, private and non-profit training organizations, workforce development boards, and unions;
- More consistent funding to help support job creation related to the BARCAP and training to help frontline community members to secure those jobs;
- Tracking how the energy transition is impacting the local workforce and partnering to support workers facing disruptions;
- Considering ways to encourage high-quality employment in local and regional government projects.



Just transition in the BARCAP region

A carbon neutral future means shifting to a clean energy economy powered by zero-emitting fuel sources. However, this shift can significantly impact workers from fossil-fuel reliant industries and impact not only workers but the surrounding communities. While there are many working definitions of just transition, one helpful framework is that a just transition "refers to an integrated policy approach offering protection, support, and compensation for displaced workers and communities in specific industries or regions."[4] In the BARCAP region, a key industrial focus for a just transition is the fossil fuel refining industry.

The BARCAP region has five refineries, which, when including refinery reliant industries such as construction and trucking and transportation, employ roughly 18,000 people in the Bay Area. In 2020, the Marathon Martinez refinery in Contra Costa County idled (paused its refining operations) and laid off over 750 workers. A year later, 26% of these former employees remained unemployed, while former employees who found new jobs often faced a decline in wages and/or working conditions.[5] Assuming refinery exports from the Bay Area region decline at the same rate as projected in-state consumption, by 2045 the decrease in demand will likely lead to refinery shutdowns or a transition to new, cleaner products. Two refineries in the region have shifted production to renewable fuels.[6]

Unions and labor councils, CBOs, non-profit organizations, and local governments are working together to shape the just transition. The Contra Costa Refinery

Transition Partnership created 31 recommendations for how local and state governments can ensure a just transition for the refinery sector in Contra Costa County. The partnership includes worker associations, CBOs including the Asian Pacific Environmental Network, and non-profit organizations like the Blue Green Alliance. Recommendations include requiring a two-year notice to the public of a refinery closure or idling, establishing worker and community safety nets, and creating refinery decommissioning or clean-up standards.[7]

Just transition initiatives need to extend beyond refineries to other parts of the economy and ensure that workers and communities have a voice in these decisions. For example, in the City of Richmond, a coalition of CBOs – the Richmond Our Power Coalition – is working to advance a just transition, including a Project Support Fund that provides grants to projects directly serving local residents.[8] In addition, the Northern Waterfront area of Contra Costa County has been designated a Green Empowerment Zone (GEZ) to identify key projects in the area that can revitalize a clean energy economy. This includes designing and implementing a strategy to help grow a high-road clean energy manufacturing ecosystem in and around the GEZ that will advance a just transition.[9] Another example, the Bay Area High-Road Manufacturing Initiative led by Working Partnerships USA alongside other CBOs and labor organizations, is coordinating multiple pilot projects to grow the manufacturing sector in a way that achieves climate goals and supports workers.[10] Plans and projects like these will be integral in ensuring a clean economy that centers and protects workers in the transition to a carbon neutral future.



12.5.2 Frontline communities

In addition to the potential benefits and unintended consequences for each BARCAP measure, the Frontline Communities Impacts Analysis highlighted recommendations for implementation in each sector. A snapshot of the recommendations is below. For the full list of impacts, see Appendix D.



Building sector: Consider opportunities to pair building electrification with health and safety, weatherization, and building efficiency upgrades; emphasize workforce development and contractor support, building workforce transition into program design and budgeting.



Natural and Working Lands sector: Make funding flexible, offering sustained, low-barrier funding options for frontline groups; invite frontline and tribal co-leadership in land stewardship and management activities; pair urban greening with anti-displacement strategies (e.g., land trusts, rent control).



Power sector: Use equity criteria in project siting and design; protect low-income and medically vulnerable customers and ensure renters benefit from programs; fund inclusive community engagement processes; develop and utilize community benefits agreements for large energy projects.



Transportation sector: Encourage public and private fleet owners to deploy EVs in frontline communities; subsidize frontline community transition to EVs; emphasize public input opportunities in planning EV transitions; install charging infrastructure near affordable and multifamily housing.



Waste sector: Support smaller community-scale, decentralized composting options; increase multilingual, multi-media education and communication strategies for waste sorting; minimize siting large-scale compost facilities near residential areas of frontline communities; consider developing community benefit agreements near waste management sites to increase facility accountability and reduce impacts of odors.

12.5.3 Outreach and engagement

The BARCAP was shaped by an intentional and rigorous outreach and engagement process. As the finer details of implementation are developed, the Air District and implementing partners will continue to center outreach and engagement, particularly with CBOs and frontline communities.

CBOs play a critical role in implementation, and the Air District will continue to encourage

lead implementers to form meaningful partnerships with them throughout BARCAP implementation. They are not only 'trusted messengers' in delivering information and encouraging frontline community members to engage in climate efforts, but they are subject matter experts in embedding environmental justice in climate action and may lead climate actions themselves (e.g., cultural burning or 'good fire', urban tree planting). CBOs also play a critical role in holding institutions and implementers accountable in making sure that frontline communities benefit from climate actions. The Air District will also work with CBOs in providing updates on how the implementation of BARCAP measures has benefited frontline communities. Including community voices in the implementation of BARCAP measures provides an opportunity for people who are underrepresented in decision-making processes to take ownership in their future and climate impact outcomes.

The Air District recognizes the importance of continuing the conversation on climate action in the BARCAP region, particularly with frontline communities and young people, and will work to uplift all voices in implementation. Youth engagement, a priority brought up during the public comment period, will also be an important component of the implementation process. Young people bring fresh perspective, innovative thinking, and a sense of urgency to conversations around climate action. The Bay Area includes numerous youth organizations and movements that are leading advocacy and education among their peers. Talking about climate change – including climate impacts, solutions, and specific roles people can play – is one of the most important actions individuals can take to inspire hope and collective action. Outreach and educational efforts should support these conversations and more collective action.



12.5.4 Economic development

A history of concurrent climate action and economic growth in the Bay Area and California shows that economic growth and reducing GHGs are not at odds; rather, climate action can drive economic development. The Air District and implementing partners can refer to recent economic roadmaps like the State Economic Blueprint and the Bay Area Jobs First Collaborative Regional Plan and other local plans to understand how implementation of the BARCAP can align with and support regional economic development priorities. For instance, many measures in the BARCAP are consistent with the sectors identified by the State Economic Blueprint as critical to include in future economic development efforts.[11]

The region should also be intentional in how implementation of this plan leads to local job creation and new businesses and spurs innovation and public-private partnerships. Private investment resulting from BARCAP-related economic development activities may in turn be a key source of funding and financing for implementation.



12.6 MOVING FORWARD TOGETHER

Several of the 16 measures and 57 actions in the BARCAP are already underway. They include ongoing activities that will ramp up and/or expand in scope over the next year or two. Other measures may depend upon new funding or staff resources to be secured before implementation can begin. In those cases, preliminary implementation activities may include convening conversations with lead and supporting implementers and stakeholders, including CBOs, to determine initial organizational stages and steps to be taken toward securing resources. Implementation will also include identifying opportunities for collaboration and coordination with Santa Clara County on related and complementary measures in the Santa Clara County/San Benito County Comprehensive Climate Action Plan.

No single agency or plan, however, can solve the problem of climate change on its own. Achieving the critical transition to a clean economy will require a collaborative effort on the part of governmental agencies at all levels, business and industry, community and environmental groups, educational institutions and Bay Area residents. It will also necessitate a commitment to ensure that all Bay Area

communities benefit from this transition, particularly frontline communities.

Everyone has a role to play in the transition to a clean energy economy and carbon neutrality. Individual actions among residents, households and businesses to reduce GHG emissions are important, but when they are combined with coordinated, collective action, they can become transformational. Such collective action can include community-based initiatives like tree-planting, coordinated purchasing of low-carbon products, community education and outreach, participating in civic forums, joining advocacy groups, and talking about climate change action with family, friends, and community members. Individuals can bring climate action into shared spaces like neighborhood groups, schools, workplaces, faith-based congregations, or local government councils and commissions. Tackling actions together enables more people to join in, begins to shift norms, and motivates leaders to invest in infrastructure solutions. Working collectively on climate action can bring shared joy and agency. Similar to how the BARCAP aims to amplify state and local actions through regional collaboration, community action can amplify the impacts of individual action.

The Bay Area has many necessary attributes that are needed to tackle the climate challenge. It is one of the most socially and technologically innovative regions in the world, with a strong environmental ethos, world-class academic institutions, robust networks of non-profits and CBOs, and progressive leadership in business and government. By rising to the challenge together, the BARCAP region can achieve local, regional, and state climate goals while fostering thriving communities, healthy natural ecosystems, and a sustainable, inclusive, and prosperous economy that continues to lead in developing new technologies and innovations needed to address the climate challenge.



ENDNOTES

1 This funding and financing roadmap was developed for the Air District by HIP Investors, Inc.

2 According to the State of California's Future of Work Commission "Quality jobs provide a living wage, stable and predictable pay, control over scheduling, access to benefits, a safe and dignified work environment, and opportunities for training and career advancement." Institute for the Future, "A NEW SOCIAL COMPACT for work and workers," California Future of Work Commission, March 2021, https://www.labor.ca.gov/wp-content/uploads/sites/338/2021/02/ca-future-of-work-report.pdf#:~:text=Ensure%20that%20more%20workers%20have%20quality%20jobs.,workers%20report%20being%20in%20a%20quality%20job.

3 These occupational titles are used by the federal government for tracking purposes.

4 Caro Zabin et al., "Putting California on the High Road: A Jobs and Climate Action Plan for 2030," California Workforce Development Board, 2020, cwdb.ca.gov/wp-content/uploads/sites/43/2020/09/AB-398-Report-Putting-California-on-the-High-Road-ADA-Final.pdf; Community-based organizations have developed a more expansive definition, which can be found here: CJA_JustTransition_Principles_final_hi-rez.pdf.

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6 Christina E. Simeone and Ian Lange, "San Francisco Bay Area Refinery Transition Analysis," The BlueGreen Alliance Foundation, 2022, https://www.bluegreenalliance.org/wp-content/uploads/2025/01/San-Francisco-Bay-Area-Refinery-Transition-Analysis.pdf.

7 The BlueGreen Alliance Foundation, "Report and Recommendations of the Contra Costa Refinery Transition Partnership," The BlueGreen Alliance Foundation, 2025, https://www.bluegreenalliance.org/wp-content/uploads/2025/01/Contra-Costa-Refinery-Transition-Report-and-Recommendations-2025.pdf.

8 "Funds," Richmond Our Power Coalition, Accessed October 16, 2025, https://www.ourpowerrichmond.org/funds.

9 John Gioia and John Kopchik, "Overview of the Green Empowerment Zone," Contra Costa County, 2025, https://www.baaqmd.gov/~/media/files/board-of-directors/2025/ssc_presentations_070925_rv_op-pdf.pdf?rev=1aa920d8b0ec41b5bac4a876e7ab16cc&sc_lang=en.

10 "Bay Area High-Road Manufacturing Initiative," All Home, Accessed September 1, 2025, https://www.allhomeca.org/catalyst-projects/bay-area-high-road-manufacturing-initiative/.

11 The State Economic Blueprint identified four categories of sectors that are critical to future economic development. The sectors that align with BARCAP measures include Strengthen: Sectors where the state has a competitive position and/or significant employment but where growth and wages are leveling, including working lands & water (agricultural production). Accelerate: Sectors with moderate to high projected growth that are read for expansion where additional investments could bend the curve to generate growth, including clean economy (batteries, solar, zero emission vehicles, onshore wind) and working lands and water (agtech and farm equipment). Bet: Emerging sectors with significant investment or high strategic importance to the innovation ecosystem, including clean energy economy (carbon management, hydrogen), working lands & water (bioeconomy, blue economy and tech), and high-tech (artificial intelligence). Anchor: Regional anchors that are critical for attracting and supporting industry activities while often providing quality, good-paying jobs within local communities, including education & skilled workforce, infrastructure (transmission, transportation infrastructure).

Appendix A

BARCAP Region Greenhouse Gas Emissions Inventory

March 2026

Bay Area Regional Climate Action Plan

BARCAP Region Greenhouse Gas Emissions Inventory

GHG Inventory Technical Appendix of BARCAP Report

October 2025

BARCAP REGION EMISSIONS INVENTORY

SUMMARY REPORT FOR GREENHOUSE GASES

Lead Author:

Abhinav Guha, Principal Air Quality Engineer

Principal Contributors:

Tan Dinh, Air Quality Engineer
Yuan Du, Principal Air Quality Engineer
David Holstius, Senior Advanced Projects Advisor
Ariana Husain, Principal Air Quality Engineer
Sally Newman, Senior Air Quality Specialist
Michael Nguyen, Senior Air Quality Engineer
Nicholas Tang, Advanced Projects Advisor

Reviewers:

Virginia Lau, Manager of Emissions and Community Exposure Assessment Section
Song Bai, Director of Assessment, Inventory, and Modeling Division
Greg Nudd, Deputy Executive Officer of Science and Policy

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Glossary

Abbreviation	Definition
ABAG	Association of Bay Area Governments
BAAD	Bay Area Air District (also known as the Air District)
BAAQMD	Bay Area Air Quality Management District (also known as the Air District)
BARCAP	Bay Area Regional Climate Action Plan
CAP	Criteria Air Pollutant
CARB	California Air Resources Board
CADF	California Department of Finance
CEC	California Energy Commission
CEPAM	California Emission Projection Analysis Model
CFCs	Chlorofluorocarbons
CH_4	Methane
CO_2	Carbon Dioxide
EIA	Energy Information Administration
EMFAC	EMission FACtors Model
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GWP	Global Warming Potential
HCFCs	Hydrochlorofluorocarbons
HFCs	Hydrofluorocarbons
IPCC	Intergovernmental Panel for Climate Change
MSA	Metropolitan Statistical Area
$MMTCO_2e$	Million Metric Tons of Carbon Dioxide-Equivalent
N_2O	Nitrous Oxide
PFCs	Perfluorocarbons
PM_{10}	Particulate Matter (inhalable particles with diameter $\leq$ 10 micrometers)
$PM_{2.5}$	Particulate Matter (fine inhalable particles with diameter $\leq$ 2.5 micrometers)
PTO	Permits-to-Operate
SFBA	San Francisco Bay Area
SF_6	Sulfur Hexafluoride
TAC	Toxic Air Contaminant
TOG	Total Organic Gases
USEPA	United States Environmental Protection Agency
USDA	United States Department of Agriculture
VMT	Vehicle Miles Traveled

EXECUTIVE SUMMARY

Inventory Overview

The Bay Area Air District (Air District) is the regional government agency responsible for the regulation of air pollution from stationary sources within the San Francisco Bay Area (SFBA). The Air District's jurisdiction includes Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, southwestern Solano, and southern Sonoma counties. The agency maintains inventories of emissions for criteria air pollutants (CAPs), greenhouse gases (GHGs), and toxic air contaminants (TACs) to:

- Comply with statutory emissions reporting requirements;
- Provide inputs for regional air quality modeling to estimate pollutant concentrations and exposures;
- Support the development of new regulations and amendments to existing regulations to reduce emissions; and
- Support regional and local air quality and climate action planning and policy initiatives.

The Air District's GHG emissions inventory is an accounting of annual emission estimates of major climate-warming pollutants resulting from human activities (also known as anthropogenic emissions) that are grouped by source category for each county. This report presents an overview of the regional GHG emissions inventory from 2000[1] to 2050 across an eight-county jurisdiction developed for the Bay Area Regional Climate Action Planning (BARCAP) Initiative. The BARCAP is the Air District's regional climate action plan for the Northern and Central Bay Area region, developed under funding from the United States Environmental Protection Agency's (USEPA) Climate Pollution Reduction Grant. The BARCAP covers the same jurisdiction as the Air District but does not include Santa Clara County, which is considered by the USEPA as part of a neighboring and separate planning area for their CPRG program. The pollutants covered in the GHG emissions inventory are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and several long-lived gases with high Global Warming Potentials (GWPs)[2] such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6), as well as chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs). Although CFCs and HCFCs have been banned, and their use phased out,[3] historical emissions and residual emissions from legacy equipment are included in the GHG emissions inventory.

Exposure to ambient levels of these pollutants is not directly harmful to human health. However, these pollutants are primary drivers of climate change, which in turn has negative air quality and health impacts in the SFBA. For example, rising temperatures due to global warming increases heat stress and accelerates ozone and secondary particulate matter formation; and more severe wildfires elevate exposure to harmful pollutants. The GHG emissions from fuel combustion and other sources are often accompanied by emissions of co-emitted criteria air pollutants and toxic air contaminants which have direct local air quality and health impacts. Additional discussions about climate and air quality related health impacts can be found in Chapter 5 of the BARCAP report.

The regional source category-level GHG emissions inventory is estimated in alignment with state and federal methodologies, based on detailed research to gather data for the following key variables:

- Activity data or throughput – a measure of emission-generating processes, operations, and services.
- Emission factors – values that represent the amount of a GHG pollutant emitted per unit quantity of the activity or throughput; and
- Control factors – quantitative measure of the reduction in GHG pollutant emissions achieved through pollution-control devices or regulated changes in facility operations.

Forecasted and certain historical emissions are derived using growth profiles. For future projections, growth profiles are developed based on selected socio-economic indicators that characterize how activity data for source categories are expected to evolve over time. For historical backcasting, when direct activity data are unavailable, growth profiles are developed to estimate historical activity levels and emissions.

Emissions Summary

This section presents four key perspectives useful to understanding GHG emissions:

- By sector (i.e., source types)
- By pollutant
- By geographic area (by county)
- By year (i.e., trends and forecasts)

Contribution by sector

The BARCAP GHG emissions inventory follows an inventory framework consistent with California's GHG inventory categorization scheme. GHG emissions source categories are grouped into six economic sectors,[4] which are aligned with CARB's sector definitions:[5]

- Transportation
- Buildings
- Industrial
- Power
- Waste
- Agriculture

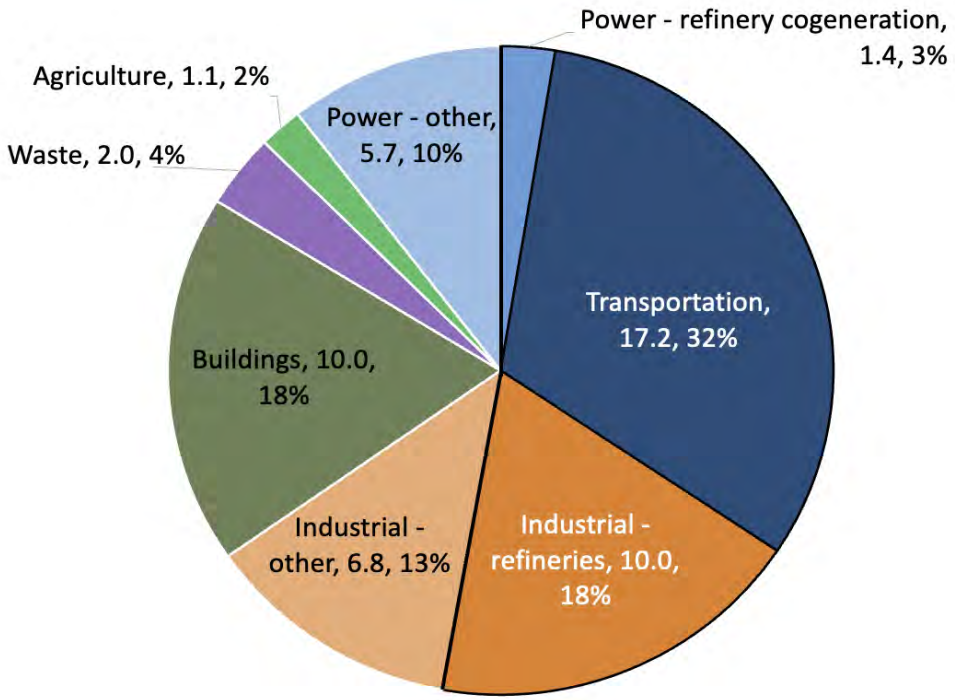


Figure 1: 2022 GHG emissions inventory by sector for the BARCAP region ($MMTCO_2e$).

The annual GHG emissions from all six sectors for the BARCAP region for the base year 2022 is approximately 54.1 million metric tons of CO_2-equivalent ($MMTCO_2e$), which represents about 15% of California's 2022 statewide GHG emissions in 2022.[6] Transportation (32%) is the largest contributing sector in the BARCAP region, followed by the industrial (31%) sector (Figure 1). The buildings sector contributes about 18% and the power sector contributes about 13% to the annual GHG inventory. The waste and agriculture sectors combined contribute less than 6% of the regional total.

As currently defined for the BARCAP, the transportation sector only accounts for GHG emissions from the combustion (end-use) of fossil fuels to move people and goods (e.g., tailpipe emissions from on-road motor vehicles, fuel combustion exhaust from ships and airplanes, etc.). However, every lifecycle stage of fossil fuel extraction, processing, and use for the transportation sector generates GHG emissions. While the BARCAP region has negligible fossil fuel extraction sources, processing of fossil fuels for the transportation sector at the BARCAP region's refineries contributes significantly to the industrial sector emissions, accounting for over 60% (~10 MMTCO2e) of that sector's total GHG emissions. In addition, on-site cogeneration of electricity for use at these refineries, categorized under the power sector, adds another 1.4 MMTCO2e or 20% to that sector's total. When combined with the transportation sector emissions, the GHG emissions related to transportation that are associated with both production (extraction and processing) and consumption (combustion) of fossil fuels account for over half of the total regional GHG emissions in 2022 (53% or 28.6 $MMTCO_2e$), as seen by the sectors outlined in black in Figure 1.

The BARCAP region is heavily urbanized and thereby the share of transportation sector in the regional GHG emissions inventory is larger than its corresponding share in the national emissions inventory (32% versus 28%).[7] In the BARCAP region, GHG emissions from the buildings sector are primarily attributable to space- and water-heating (combined total of 67% of the sector's emissions) and the use of refrigerants and solvents in buildings (21% of building sector emissions). Due to relatively high population density in urban areas, the buildings sector accounts for a higher share of the region's emissions as compared to the national average (18% versus 13%). The power sector represents a lower share in the regional GHG inventory compared to the national average (13% versus 25%), largely because a greater portion of the region's electricity is produced from renewable sources such as wind, solar, hydrothermal, etc., reducing the region's reliance on natural gas-fired power plants.

A subsector breakdown of the base year 2022 GHG emissions inventory is provided in Figure 4 and Table 3.1 in Section 3 of this appendix. Emissions data for the Air District's regional GHG inventory, which includes the full jurisdiction of the Air District including Santa Clara County, are presented in an interactive online dashboard on the Air District's emissions inventory webpage.[8]

Contribution by pollutant

Reviewing the pollutant composition in the BARCAP GHG inventory is useful to identify different types of GHGs associated with different sources. Analyzing the pollutant distribution in the BARCAP region compared to the national profile reveals distinct sources and emissions characteristics unique to the region. The contribution of CH_4 (>6%) and N_2O (~2%), which are primarily emitted from waste management, animal agriculture, soil management, and petroleum production systems, is a smaller share in the BARCAP GHG inventory compared to their contribution at the national level of 11% for CH_4 and 6% for N_2O.[9] In the BARCAP region, high-GWP gases like HFCs and PFCs, emitted from a variety of sources such as refrigeration, air conditioning, fire suppressants, and insulation, etc., represent a significant proportion of GHG emissions from the buildings sector (>20%, Figures 4 and 5). This results in a higher overall regional contribution (~6% of the regional GHG total) of high-GWP gases than that in the national inventory (~3%). CO_2, largely produced through fuel combustion, remains the most prevalent GHG pollutant in the region (>86% of the regional inventory; see Figure 5).

Contribution by county

Evaluating the geographic distribution of GHG emissions across the BARCAP region identifies those counties with the largest contributions to GHG emissions and the sectors driving those emissions Figure 2 shows the distribution of annual regional GHG emissions by county across the BARCAP region. Contra Costa County is attributed to having the highest GHG emissions (~45%) in the region, due mostly to the presence of large sources in the industrial sector (e.g., refineries) and in the power sector (e.g., power plants) located in this county. The southern Solano County, which accounts for 10% of the BARCAP region's GHG emissions despite only having 4% of the Bay Area's population, is also largely impacted by industrial sources. In the other seven counties that have fewer heavy industries, the

transportation and buildings sectors account for the majority of county-level GHG emissions. A detailed breakdown of emissions by county is provided in Table 3.2 in Section 3 of this appendix.

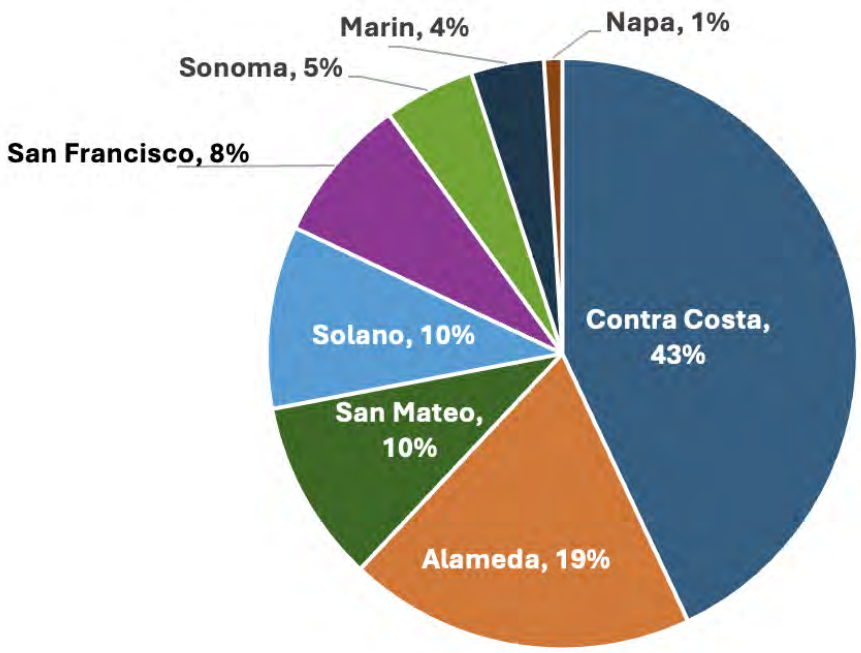


Figure 2: 2022 GHG emissions inventory by county for the BARCAP region ($MMTCO_2e$)

Trends and forecasts

A time series of historical GHG emissions along with projected future emissions allows the Air District to assess the progress the region has made in achieving its climate objectives and future policy goals. Overall, the BARCAP region's GHG emissions have dropped from 62.2 $MMTCO_2e$ in 2000 to 54.1 $MMTCO_2e$ in 2022 marking a 13% reduction, consistent with the declining trend in California's state inventory (19.8% decrease) and the U.S. national inventory (14.5% decrease) over the same period.[10] Most of the GHG emissions reductions in the BARCAP region are attributed to the transportation (-23%), industrial (-9%), and power (-23%) sectors as shown in Figure 6, largely due to regulations in goods movements and the use of renewable sources for energy generation. This downward trend is partially offset by an increase in GHG emissions from the buildings (+14%) sector, indicating an increasing demand for energy from the Bay Area's growing population and businesses. A significant decline in GHG emissions is predicted in the buildings sector, primarily due to the Air District's Regulation 9 Rule 4 and Regulation 9 Rule 6,[11] which require newly installed natural gas furnaces and water heaters to meet a zero nitrogen oxides (NO_X) emissions standard starting with water heaters in 2027.

Contents of Summary Report

The BARCAP GHG inventory reflects methodological advancements over the previous inventory.[12] This report summarizes the key findings resulting from this latest inventory update. Section 1 discusses the general scope of the inventory including geographic coverage, key pollutants, and sector hierarchy schema. Section 2 presents the general methodology used to develop the inventory based on source characteristics and availability of supporting data sources. Section 3 provides a breakdown of the regional GHG emissions by process, sector, and pollutants, and highlights key observations at the regional and sector level. Finally, Section 4 provides an overview of key assumptions and limitations in the emissions estimates and identifies areas for future improvement.

1. INVENTORY SCOPE AND ORGANIZATION

This section provides an overview of the BARCAP GHG inventory, which includes geographical area covered by the plan, identification of the key pollutants, and a description of the source sectors and subsectors using an organizational hierarchy schema.

1.1. GEOGRAPHY

The BARCAP GHG inventory covers eight counties including Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, southwestern Solano, and southern Sonoma counties (see Figure 3). Only GHG emissions that are generated or produced in the portions of Solano and Sonoma counties that are part of the Air District's jurisdiction are accounted for in this inventory.



Figure 3: Map of the BARCAP region that includes six full and two partial (Solano and Sonoma) counties

Each county in the BARCAP region has unique and diverse characteristics that serve as key predictors of trends likely to influence future activity and, in turn, estimated GHG emissions. The Air District has

relied on these predictors which include population distribution, socioeconomic data, goods consumption patterns, etc. to project future growth or change in GHG emissions across sectors and subsectors. As shown in Table 1.1, these predictors vary significantly among counties and highlight the complexities in quantifying the base year emissions and predicting future activities summarized in this report.

Table 1: Selected demographic and socio-economic indicators by county for the BARCAP region for 2022.

County[a]	Area in acres[b] (%)[c]	Human Population[d] (%)[c]	Total Natural Gas Consumed in Millions of Therms[e] (%)[c]	Automobile Registration Count[f] (%)[c]	Total Electricity Consumed in Giga Watt-Hours[e] (%)[c]
Alameda	473,639 (20)	1,643,683 (30)	377 (17)	1,035,244 (29)	10,395 (29)
Contra Costa	506,953 (21)	1,149,841 (21)	892 (41)	807,986 (22)	8,338 (24)
Marin	331,834 (14)	255,459 (5)	66 (3)	188,149 (5)	1,293 (4)
Napa	502,039 (21)	135,564 (3)	39 (2)	93,614 (3)	1,029 (3)
San Francisco	30,080 (1)	840,575 (15)	214 (10)	386,770 (11)	5,121 (14)
San Mateo	289,647 (12)	742,051 (13)	204 (10)	562,003 (16)	4,177 (12)
Solano	132,846 (5)	312,919 (6)	248 (12)	208,801 (6)	2,279 (7)
Sonoma	145,060 (6)	412,502 (7)	107 (5)	290,573 (8)	2,477 (7)

a: Only represents the Air District portion of Solano and Sonoma counties.
b: Solano and Sonoma counties portions of the Air District are 48% and 37%, respectively.
c: The numbers in parentheses indicate percentage relative to the whole region.
d: Data is obtained from the California Department of Finance for the year 2022. Solano and Sonoma counties population portions within the Air District are 70% and 86%, respectively.
e: Data is obtained from the California Energy Commission for 2022. Solano's and Sonoma's energy consumption is derived from the proportional distribution of human population of the Air District portions of the two counties (70% for Solano and 86% for Sonoma, respectively).
f: Registration data are obtained from the California Department of Motor Vehicles for 2022. The Solano and Sonoma counts are derived from the proportional distribution of human population of the Air District portions of the two counties (70% for Solano and 86% for Sonoma, respectively).

1.2. POLLUTANTS

The greenhouse gases covered in the BARCAP regional emissions inventory align with those included in United States Environmental Protection Agency's National Emissions Inventory[13] and California Air Resources Board's statewide GHG emissions inventory.[14] The BARCAP GHG inventory includes emissions of the following GHG pollutants:

- **Carbon Dioxide (CO_2)**: CO_2 is a major emission by-product of all fossil fuel (e.g., natural gas, gasoline, diesel, wood, etc.) combustion processes, and to a minor extent the biological decomposition of all organic material (e.g., animal waste, compost, agricultural residues, etc.), noted as CO_2_bio in the emissions inventory. CO_2_bio emissions are from biogenic sources and

are excluded from the total anthropogenic GHG emissions in the BARCAP inventory. See Section 4 -Uncertainties and Future Improvements for more information on CO_2_bio.

- **Methane (CH_4)**: CH_4 is a major constituent of natural gas. In the BARCAP region, CH_4 is primarily emitted from leakage of natural gas across the oil and gas and energy infrastructure, anaerobic decomposition of solid and liquid organic waste (at municipal landfills and wastewater treatment plants), direct emissions from livestock and other agricultural operations, and to a lesser extent, incomplete combustion of fossil fuels.

- **Nitrous Oxide (N_2O)**: N_2O is primarily emitted from nitrification and denitrification processes in soils (arising from fertilizer use for both agricultural and commercial/residential purposes). Other emission sources include tailpipe emissions from automobiles, incomplete combustion of fossil fuels, and organic waste decomposition at municipal landfills and wastewater treatment plants.

- **Fluorinated Gases**: These long lasting GHGs are synthetically generated (human-produced) and emitted as fugitive losses across a variety of households, commercial and industrial applications and processes. Fluorinated gases included in this inventory are:
  - Hydrofluorocarbons (HFCs),
  - Perfluorocarbons (PFCs),
  - Sulfur Hexafluoride (SF_6),
  - Chlorofluorocarbons (CFCs), and
  - Hydrochlorofluorocarbons (HCFCs).

  These gases are typically inert, and they stay in the atmosphere for hundreds of years once emitted; therefore, local and federal regulations are focused on phasing out their use. CFCs and HCFCs were widely used as refrigerants and solvents until ozone depleting substances were banned as part of a 1989 global agreement under the Montreal Protocol.[15] Minor contributions of CFCs and HCFCs are included in the GHG inventory due to recycling and salvage of pre-ban and legacy equipment. HFCs and PFCs are substitutes for ozone depleting substances and are widely used as refrigeration and air conditioning agents, solvents, and aerosols. They are also byproducts of semiconductor manufacturing process. Emissions of these pollutants occur across all major sectors and are collectively represented as one group, known as high-global warming potential (GWP) gases. SF_6 is the most potent man-made GHG per Intergovernmental Panel on Climate Change (IPCC) and is used as an insulating gas in electrical transmission equipment (e.g., circuit breakers). Most of the fluorinated gases are emitted in exponentially smaller quantities as compared to CO_2, CH_4, and N_2O; however, due to their extremely high GWPs (described below), the combined emissions of these fluorinated high-GWP gases are a significant portion of the overall GHG inventory.

The BARCAP GHG inventory incorporates the GWPs reported in the IPCC Fifth Assessment report, released in 2014,[16] which includes impacts of climate feedback in GWP calculations. The GWP value of each GHG reflects the climate forcing caused by a kilogram of emissions relative to the same mass of carbon dioxide (CO_2). Thus, GWP of CO_2 is set equal to one while all other GHG pollutants have GWP

relative to CO_2. The GWP of a GHG is determined by the intensity of infrared absorption and how long emissions remain in the atmosphere. GWPs are calculated using a set time horizon. The GWPs used for the BARCAP GHG inventory are considered over a 100-yr timeframe, consistent with the approach adopted by the USEPA and CARB for their GHG inventories. Since the effective radiative impact of short-lived GHGs (e.g., CH_4 has a lifetime of 10-12 years) is more profound over a shorter time-horizon, the Air District may use short-term GWPs (such as 20 years) for estimating emissions inventories for rulemaking and climate action purposes.

1.3. BASE YEAR

The BARCAP GHG inventory covers annual emission estimates from permitted and non-permitted stationary sources, as well as on-road and off-road mobile sources, from 2000 to 2050. The year 2022 serves as the base year for this emissions inventory as it is the latest year with comprehensive assessment conducted to estimate total emissions across all source categories and sectors. The inventory for this base year is used as a reference point or benchmark to:

- Track trends in emissions over time to evaluate progress towards achieving targets;
- Develop current and future GHG-related analysis scenarios; and
- Support development of local climate action plans and mitigation strategies.

The year 2022 emissions include effects of adopted regulations but exclude the influence of non-enforceable climate protection guidelines and recommended policies. Socioeconomically, year 2022 is also considered a representative “business as usual” year, reflecting a return to typical activity levels following the COVID-19 pandemic. In some cases, emissions may be estimated using the pre-pandemic base year 2019 when data for 2022 are unavailable. The GHG emissions for 2023 and beyond are typically projected based on the base year emissions under a business-as-usual scenario.

1.4. ORGANIZATIONAL HIERARCHY

The BARCAP GHG inventory follows an inventory framework that aligns with CARB’s GHG inventory categorization scheme to:

- Use emission factors and methodology by source category consistent with CARB’s statewide GHG emissions inventory;[17]
- Extract source category-specific emissions inventory for criteria air pollutants (CAPs) at a county-scale from CARB’s California Emissions Projection Analysis Model,[18] and to use CAPs as surrogates to derive and proportion GHG emissions; and,
- Leverage growth projections from CARB’s 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan)[19] to forecast future GHG emissions for equivalent source categories, wherever applicable.

The regional GHG inventory is classified into four levels with the first level based on the economic sector, followed by two lower levels describing the general and specific processes generating the emissions, respectively. These three sector levels are ultimately linked to the source-category level, the most granular grouping in which emissions are reported in this GHG inventory, as shown below:



In Level 1 classification, GHG emission sources are classified across six economic sectors,[20] which align with USEPA' s classification and are also used by CARB to develop and implement GHG emission reduction strategies:

- **Transportation** – The transportation sector encompasses emissions from all mobile sources including on-road vehicles (passenger cars, light and heavy-duty trucks, and buses etc.) and all non-road transportation modes (aircraft, locomotives, ships, etc.). It is the largest contributor of the six assumed sectors to California's GHG emissions, primarily due to combustion of fossil fuels. The contribution of this sector to GHG emissions would grow larger if upstream emissions associated with production and processing of transportation-related fuels were included in this group instead.

- **Buildings** – This sector includes direct emissions from energy consumption in buildings, such as heating, cooling, cooking, lighting, and appliance use, as well as some off-road machinery (e.g., lawn and garden equipment, airport ground support equipment, etc.). The primary emissions sources are combustion of natural gas and other fuels for space and water heating, and fugitive emissions of high-GWP gases from refrigeration and air conditioning systems.

- **Industrial** – The industrial sector includes emissions from manufacturing, construction, petroleum refining, and oil and gas extraction activities, as well as some off-road machinery (e.g., construction and mining equipment, etc.). It encompasses emissions from the combustion of fossil fuels for energy, chemical reactions during industrial processes, and fugitive emissions from equipment leaks and other sources. Key currently operating and/or now shutdown industrial sources in this sector include refineries, cement plants, food processing facilities, and chemical manufacturing that are permitted by the Air District.

- **Power** – This sector covers emissions from the production of electricity at power plants and cogeneration facilities located within the BARCAP region. GHG emissions arise from the combustion of fossil fuels (such as natural gas) to produce electrical energy and fugitive leaks of methane from natural gas infrastructure at power plants. GHG emissions from imported electricity generated outside the BARCAP region are not included in the regional emissions

total. A review of annual power content labels of the BARCAP region's electricity retailers[21] indicates that, increasingly, most of the electricity consumed in the BARCAP region is generated from less carbon-intensive or carbon-free renewable energy sources (e.g., wind, solar, hydroelectricity, etc.). This trend lowers the demand for fossil fuel-based electricity from local generation sources.

- **Waste** – This sector includes emissions from the treatment and disposal of solid waste and wastewater at facilities located within the BARCAP region. It is conceivable that a minor fraction of this waste disposal and treatment activity may occur at facilities located outside the Air District's geographical jurisdiction. Major sources include methane emissions from landfills, emissions from composting and anaerobic digestion, and nitrous oxide emissions from wastewater treatment processes.

- **Agriculture** – The agriculture sector encompasses emissions from agricultural activities, including crop cultivation and livestock production. Key sources of emissions are enteric fermentation in ruminant animals (producing methane), manure management, fertilizer application (leading to nitrous oxide emissions), and fuel combustion for agricultural equipment. Agricultural practices also influence carbon sequestration in soils and vegetation, which is covered for all land classification types in Appendix B – 2022 Natural and Working Lands Inventory.

The definition and source composition of the economic sectors, along with exceptions to account for organizational differences at the regional level, are presented in more detail in Appendix A1.

Each economic sector is then split into four groups under Level 2, aggregated by the general processes generating GHG emissions:

- **Fuel Combustion** – This group includes emissions from combustion of all gaseous, liquid and solid fuels in internal or external combustion engines to produce energy and/or heat and steam to perform work.

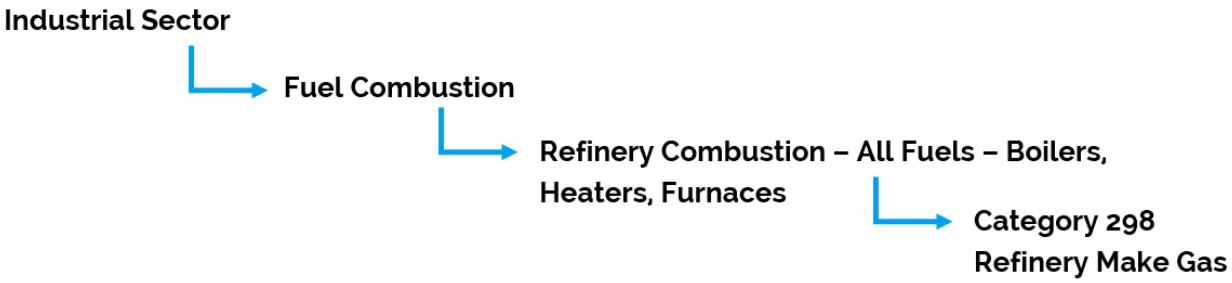
- **Process** – This group includes GHG emissions resulting from chemical, physical and biological processes within various source categories such as petroleum refining, manufacturing processes, waste management, enteric fermentation in livestock, etc.

- **Fugitive and Evaporative** – This group includes GHG emissions from intentional and unintentional leaks such as natural gas leakage across the oil and gas infrastructure, fugitive losses of SF_6 at circuit breakers, refrigerant leaks, etc.

- **Other Combustion** – This group includes GHG emissions from combustion of non-energy sources like controlled agricultural burns and waste incineration, or fires of accidental nature (e.g., structural, automobile, wildland fires, etc.).

The third level is a categorization of more detailed and similar processes grouped together called 'subsectors' (e.g., type of emissions equipment, type of fuel burned, size of source device, type of chemical or biological process). There are over 50 subsectors in the regional GHG inventory (see Appendix A2 for a detailed list) and some examples include aircraft, domestic wastewater treatment, commercial cooking, residential natural gas combustion, etc.

At the category level, the Air District starts by estimating emissions for over 560 unique source categories that are grouped into one of 55 Level 3 subsectors, which are then aggregated by general processes at Level 2 and finally catalogued by economic sector in Level 1. An example depicting this organization hierarchy is provided below. Appendix A2 summarizes the sector-process-subsector hierarchy that each of the 560+ GHG source categories fall under.



2. INVENTORY METHODOLOGY

The Air District uses a production-based approach to develop the BARCAP GHG inventory, focusing mainly on emissions released directly into the atmosphere from sources located within the region. This differs from a consumption-based approach, which attributes emissions to regional consumers by accounting for the full life-cycle emissions of goods and services consumed locally, regardless of where those emissions occur globally.

2.1. SOURCE TYPES

Emissions are estimated for each of the 560+ unique sources in the inventory based on the fundamental characteristics of the source. Emission sources generally fall into three main types depending on the emissions estimation methodology that is applicable:

- **Permitted Stationary Sources**: These sources (and related processes) are subject to the Air District's permitting requirements and the facilities with these sources have been issued permits to operate (PTO). Most of these sources are often referred to as 'point' sources due to their emissions characteristics. Some key characteristics of these sources include:

    - Most permitted source emissions are released at a fixed, defined location, such as a stack, but there are exceptions. The Air District also permits diffuse area sources including fugitive emissions from stockpiles and leaks from multiple pressure relief valves.
    - Emissions are required to be reported or calculated for each source at regular intervals, typically annually.
    - A bottom-up approach is typically used for emissions estimation (further explanation below).
    - These sources often involve combustion equipment.
    - Examples: fuel combustion emissions from reciprocating engines, prime and backup diesel generators, and industrial boilers.

- **Non-permitted Stationary Sources**: These sources are not subject to the Air District's permitting requirements and do not need a PTO, although they could be located at facilities that have obtained a PTO for other emissions sources. These sources are often referred to as 'area' sources due to their emissions characteristics. Some key characteristics of these sources include:

    - Emissions originate from numerous diffuse points that may be difficult to locate or track individually.
    - Emissions are not required to be systematically reported or calculated.
    - Emissions estimation method may involve either a bottom-up or a top-down scaling approach.
    - These sources often involve fugitive emissions or diffuse processes.

- Examples: biologically produced methane emissions at closed landfills, anaerobic decomposition at wastewater treatment plants, and livestock manure management emissions.

- **Mobile Sources**: These sources (and related processes) are subject to federal and state-level regulations but are not within the Air District's regulatory authority. These sources are usually grouped into on-road and off-road source categories. Some key characteristics of these sources include:

  - Emissions originate from sources that typically move from place to place as they operate.
  - Source activities are not tracked individually (e.g., vehicle miles traveled per vehicle) but are typically estimated as an aggregate for the whole source group (e.g., total vehicle miles for light-duty vehicles).
  - Emission rates can vary by emission process (e.g., running exhaust, start exhaust, idling exhaust, tire or brake wear, etc.); hence emissions factors are process dependent.
  - To account for vehicle/equipment fleet complexities, the Air District uses modeling tools (e.g., EMFAC2021 for on-road sources and OFFROAD2021 for off-road sources) that apply a bottom-up, top-down, or a hybrid calculation approach for emissions estimation.
  - Examples: exhaust, tire wear, and brake wear emissions from passenger cars, heavy-duty trucks, and buses; exhaust emissions from bulldozers, forklifts, and tractors; exhaust emissions from ships and aircraft.

2.2. EMISSION CALCULATIONS

As previously mentioned, the Air District typically uses two types of estimation approaches—a bottom-up or a hybrid method—to estimate GHG emissions, depending on source types and available calculation support data.

Bottom-up Permitted Source Approach

Permitted sources are stationary operations that emit air pollution into the atmosphere at fixed location(s) within a facility, and for which the Air District has issued a PTO (e.g., steam reforming at refinery hydrogen plants).

During the permitting process, the Air District collects site-specific information from the operating facility and/or determines from published literature, e.g., U.S. Environmental Protection Agency's (USEPA) AP-42,[22] source characteristics including maximum throughput, emission factors by pollutant, and temporal profile. The Air District may require an abatement device to be installed, in which case control factors will be incorporated to account for the reduced emissions. Facilities that hold an Air District PTO are required to renew their permit periodically (this period varies based on facility and source types). Upon renewal, the facilities are requested to provide updates on the source characteristics and throughput

since the past permit issuance (typically, twelve months). The throughput, emission factors, and control factors, stored in the Air District's permitting database, are used to estimate annual emissions at the source level for each county using the following equation:

$$\text{Base Year(s) Emissions}_{\text{source i, pollutant}} = \text{Activity Data}_{\text{source i}} \times \text{Emission Factor}_{\text{pollutant}} \times \text{Control Factor}_{\text{pollutant}} \times \text{GWP}_{\text{pollutant}}$$

$$\text{Base Year(s) Emissions}_{\text{county, pollutant}} = \sum_{i=1}^{N} \text{Emissions}_{\text{source i, pollutant}}$$

Where:

- **Base Year(s)** are any years for which source category-specific activity data are available and hence emissions can be directly derived.
- **Activity Data** are the throughput or activity (e.g., amount of fuel consumed, number of goods produced, counts of sources operated, etc.) at the source/equipment level. This data is typically provided by the facility during permit renewal.
- **Emission Factor** is a rate that expresses the mass of a specific pollutant emitted per unit of activity. For example, emission factors can be stated as tons of CO_2 per gallon of gasoline burned or pounds of N_2O per million standard cubic feet of natural gas combusted. GHG emissions are calculated by applying emission factors to activity data reported by facilities, which are verified or validated through source tests. When source-specific emission factors are unavailable (which is common), the Air District uses default factors derived from published literature such as USEPA's AP-42 or CARB's Mandatory Reporting Requirement[23] for Greenhouse Gases.
- **Control Factor** is a fractional ratio (between 0 and 1) to account for estimated reduction in emissions as a result of Air District's regulations or installation of a control device.
- **GWP** is the Global Warming Potential that measures the warming potential of different greenhouse gases by quantifying their radiative forcing, or the ability to trap heat, relative to CO_2. The current version of the GHG emissions inventory incorporates the GWPs reported in the Fifth Assessment report of the Intergovernmental Panel for Climate Change,[24] when calculated on a 100-year basis with climate-carbon feedback included.
- **N** is the number of permitted or non-permitted sources in a county.

Bottom-up Non-Permitted Source Approach

Non-permitted sources are diffuse, areawide sources (e.g., agricultural soil management) or small-scale stationary and exempt sources (e.g., cargo handling equipment) that typically fall outside of the Air District's direct permitting authority. As a result, GHG emissions from these sources are not systematically reported to the Air District but are estimated based on publicly available throughput or activity data for the BARCAP Region. The base year emissions estimates, using a bottom-up approach, are commonly derived by applying the following equation. Most of the terms in the equation below are defined above.

$$\text{Base Year(s) Emissions}_{\text{county, pollutant}} = \text{Activity Data}_{\text{Air District}} \times \text{Emission Factor}_{\text{pollutant}} \times \text{Fraction}_{\text{county}} \times \text{Fraction}_{\text{in Air District}} \times \text{Control Factor}_{\text{pollutant}} \times \text{GWP}_{\text{pollutant}}$$

Where:

- **Fraction$_{\text{county}}$** is the fraction of total regional emissions (between 0 and 1) estimated to be allocated to a particular county.
- **Fraction$_{\text{in Air District}}$** is an additional allocation (between 0 and 1) to account for the fraction of Solano and Sonoma County emissions that are within the Air District's jurisdiction.

Non-Permitted and Mobile Source Hybrid Approach

For some non-permitted source categories (e.g., vegetation and structural fires, high-GWP gases, etc.) and for most mobile sources (on-road and off-road categories except for the aviation subsector), source-by-source or equipment-level activity data or emission factors at county-scale are often incomplete or unavailable. In such cases, a hybrid (or custom) calculation approach is adopted to utilize a combination of bottom-up estimation and top-down scaling that starts off with a pre-existing bottom-up emissions inventory, developed for a region, state, or the nation. Scaling factors, based on key determinants such as population, housing units, and motor vehicle fuel sales, etc. are derived. These scaling factors are then applied to 1) proportion emissions from the larger inventory to each county in the region (top-down), or 2) adjust estimated emissions to reflect real-world scenarios. The scaling approach is explained with the formula below. A few of the terms in the equation below have been defined previously.

$$\text{Base Year(s) Emissions}_{\text{county, pollutant}} = \text{Emissions}_{\text{pre-existing, pollutant}} \times \text{Scaling Factor}_{\text{Air District}} \times \text{Control Factor}_{\text{pollutant}} \times \text{GWP}_{\text{pollutant}}$$

Where:

- **Emissions$_{\text{pre-existing, pollutant}}$** is the pre-existing source category emissions inventory developed for the region, state, or nation by USEPA or CARB.
- **Scaling Factor$_{\text{Air District}}$** is a representative fraction of the original inventory emissions (between 0 and 1) developed for the BARCAP region using activity proxies, surrogate socioeconomic indicators, pollutant ratios etc. (for example, population, motor vehicle fuel sales, electricity consumed, employment, etc.) to apportion the emissions to the BARCAP region county level or adjust the modeled county-level emissions to reflect a real-world scenario.

2.3. HISTORICAL AND FUTURE PROJECTION

Once base year emissions are determined, historical backcasting and forecasting of emissions relative to the base year are conducted at a source category level, using growth profiles as follows:

$$\text{Historical Emissions}_{\text{year, county}} = \text{Base Year(s) Emissions}_{\text{county}} \times \text{Growth Factor}_{\text{year, backcasting}}$$

$$\text{Future Emissions}_{\text{year, county}} = \text{Base Year Emissions}_{\text{county}} \times \text{Control Factor}_{\text{pollutant}} \times \text{Growth Factor}_{\text{year,forecasting}}$$

Where:

- **Base Year(s)** are the years for which activity data are available and emissions are directly derived.
- **Historical** refers to all years prior to the base year(s) where activity data are unavailable and emissions are extrapolated from the base year(s) emissions.
- **Future** refers to all years following the base year(s) for which the Air District forecasts emissions by applying growth factors.
- **Control Factor** is a ratio (between 0 and 1) to account for estimated additional future control and reduction in base year emissions, beyond effective control in the base year.
- **Growth Factor** is a fractional ratio (between 0 and 1) representing the normalized growth of emissions relative to the base year value. The growth profile is source specific and can be based on projected activity or other socio-economic indicators such as population.

It is important to note that when forecasting emissions, the additional control factor described above is applied to future years only in that scenario where an existing Air District regulation has not reached its full implementation or enforcement by the base year based on the schedule set in the rule.

2.4. QUALITY ASSURANCE PROTOCOL

The primary objectives for the BARCAP are to develop reliable inventories for each of the GHG-emitting sectors in the BARCAP region, and to identify options for reducing emissions from those sectors. As per the USEPA's CPRG guidelines, the BARCAP was required to develop and implement a quality assurance program that promotes confidence in the developed emissions inventory and all subsequent policy initiatives and regulatory programs based on the inventory estimates.

Accordingly, all quality objectives and criteria are aligned with the overall BARCAP objectives and laid out in a Quality Assurance Project Plan[25] (QAPP). The BARCAP GHG inventory is subject to a data review and quality control process that is described in the QAPP. All activities under this project will conform to the QAPP. The quality system used for this project is the joint responsibility of the Air District Project Manager (PM), Task Leaders (TLs), Technical Reviewers (TRs), and an organizationally independent Quality Assurance (QA) Manager.

A detailed quality assessment is applied to each of the six major sectors during the GHG inventory development process with a seven-step planned quality assessment and control activity (for each sector). This seven-step approach includes:

- Determining quality of existing Air District inventory for the BARCAP region
- Identifying, researching, and collecting other published data
- Characterizing the data
- Assessing data for accuracy and applicability

- Deriving emissions estimates
- Verification of quality
- Quantification of reduction measure options

The Air District followed the QAPP guidelines as required by the CPRG grant to assure quality of the data and validity of the inventory process, as reviewed and approved by an independent Quality Assurance (QA) manager.

3. EMISSIONS SUMMARIES AND TRENDS

This section provides a closer look into the GHG emission inventory, including process and subsector level apportionment, county breakdown by sector, and long-term emissions trends up to 2050.

3.1. EMISSIONS BY PROCESS

The majority of GHG emissions in the BARCAP region are attributed to fuel combustion (~80%), as summarized in Table 2. Although chemical and biological process emissions account for only 14% of the region's total GHG emissions, their contributions to industrial (27%), waste (>99%), and agriculture (89%) sectors are much higher. Fugitive leaks and evaporative losses make up the remaining emissions (7%), primarily consisting of CH_4 and high-GWP gases.

Table 2: Contribution of Level 2 general processes to the greenhouse gas emissions inventory for 2022.

Region	Emissions (as %)			
	Fuel Combustion	General Process	Evaporative & Fugitive	Other Combustion
BARCAP	79.3%	13.7%	7%	<0.1%

3.2. EMISSIONS BY SUBSECTOR

Figure 4 presents a sunburst chart that visually represents the major Level 3 subsectors within each of the Level 1 economic sectors contributing to the BARCAP GHG emissions inventory. The chart conveys the relative contribution of each subsector as a percentage of total regional GHG emissions. The inner ring displays the proportional emissions share of the six economic sectors, while the outer ring breaks down each economic sector's share into its major contributing subsectors (see Table 3 for the GHG emissions by subsector used to derive Figure 4).

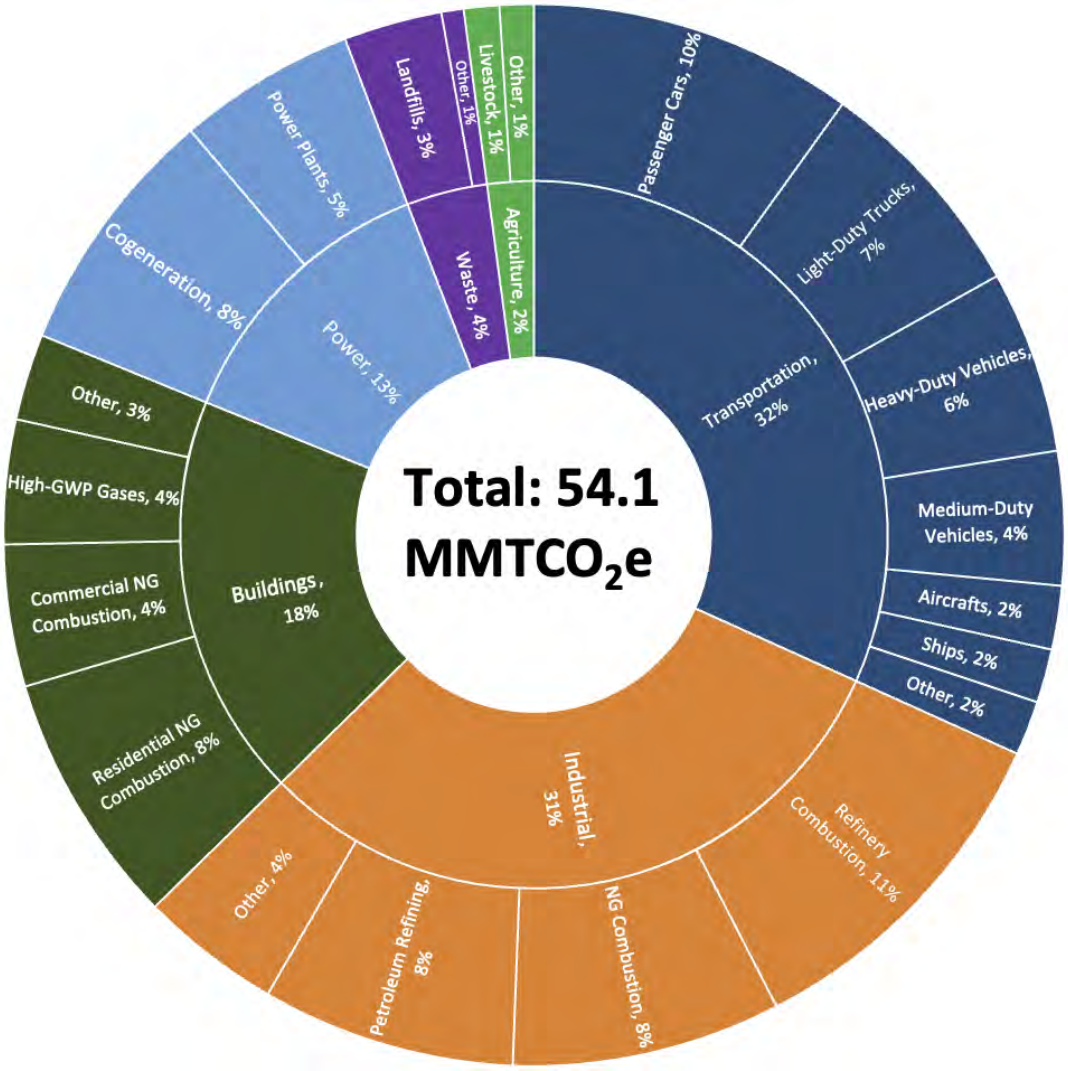


Figure 4: Level 1 (sector) and grouped Level 3 (subsector) contributions to the BARCAP regional greenhouse gas emissions inventory for 2022.

The following bullets highlight trends and changes in the current 2022 base year GHG emissions compared to the previous 2015 base year inventory:[26]

- As indicated in Figure 4 and Table 3, in year 2022, passenger vehicles (10% of total regional GHG emissions) and light-duty trucks (7%) contribute the largest share of GHG emissions to the transportation sector (31% and 22%, respectively), which is consistent with results from the 2015 GHG inventory.

- In the industrial sector, combustion of all fuels in boilers, heaters and flares at refineries (11%), non-refinery natural gas combustion (>8%), and petroleum refining process emissions (~8%) are major regional GHG sources. Refinery-related operations account for over 60% of the current industrial sector GHG emissions. In past inventories, oil refineries accounted for over 70% of GHG emissions in this sector. The transition of two refineries to process renewable feedstocks and a noted reduction in their throughput are expected to result in overall reduction of industrial sector GHG emissions in the future. The sector may see further reductions in GHG emissions from the petroleum refining subsector as gasoline consumption in the transportation sector continues to decline.

- Combustion of natural gas in the residential subsector (8%) and commercial subsector (<5%) are the major sources of GHGs in the buildings sector. Emissions in this sector are predicted to decline as regional regulations requiring the use of zero-NO_X appliances come into effect (see Emissions Trends).

- Power plants and cogeneration combined (13%) are major power sector emissions sources in the region. Electrification of buildings and transportation are expected to increase electricity demand, potentially leading to higher GHG emissions from the power sector. However, this projected increase is mitigated by the BARCAP region's growing reliance on electricity generated from renewable sources.

- About 2% of regional GHG total (or one-third of the cogeneration subsector emissions) are attributed to self-generated electricity production at petroleum refineries. As regional demand for fossil-based transportation fuels declines, crude oil throughput processed at the BARCAP region's refineries is expected to decrease as well, which would lead to a corresponding reduction in GHG emissions from this subsector within the power sector.

- Fugitive emissions from fluorinated high-GWP gases across all sectors account for 6% of the regional GHG inventory.

- Landfills constitute the largest share of GHG emissions within the waste sector and are also the largest source of CH_4 emissions, although they only account for a little more than 3% of the BARCAP GHG inventory.

Presently, the transportation sector only accounts for GHG emissions from the combustion (end-use) of fossil fuels to move people and goods (e.g., tailpipe emissions from on-road motor vehicles, fuel combustion exhaust from ships and airplanes, etc.). However, every lifecycle stage of fossil fuel extraction, processing, and use for the transportation sector generates GHG emissions. While the BARCAP region has negligible fossil fuel extraction sources, processing of fossil fuels for the transportation sector at the BARCAP region's refineries contributes significantly to the industrial sector emissions, accounting for over 60% (~10 MMTCO2e) of that sector's total GHG emissions. In addition, on-site cogeneration of electricity for use at these refineries, categorized under the power sector, adds another 1.4 $MMTCO_2e$ or 20% to that sector's total. When combined with the transportation sector emissions, the GHG emissions related to transportation that are associated with both production (extraction and processing) and consumption (combustion) of fossil fuels account for over half of the total regional GHG emissions in 2022 (53% or 28.6 $MMTCO_2e$**).**

Table 3: Sector and subsector contributions to the BARCAP region's greenhouse gas emissions inventory for 2022.

Sector	Sub-sector	Emissions ($MMTCO_2e$)	Emissions (% in sector)	Sector	Sub-sector	Emissions ($MMTCO_2e$)	Emissions (% in sector)
Transportation	Passenger Cars	5.35	31.1%	**Industrial**	Refinery Combustion – All Fuels - Boilers, Heaters and Flares	5.78	34.5%
	Light-Duty Trucks	3.79	22.1%		Non-Refinery Combustion - Natural Gas - Boilers, Heaters and Furnaces	4.44	26.5%
	Heavy-Duty Vehicles	3.02	17.6%		Petroleum Refining	4.18	25.0%
	Medium-Duty Vehicles	2.19	12.8%		Off-Road Equipment	0.68	4.1%
	Aircraft	1.05	6.1%		High-GWP Gases	0.4	2.4%
	Ships	0.89	5.2%		Other (Non-Refinery Combustion - Natural Gas - Boilers, Heaters and Furnaces, Refinery and Non-Refinery Combustion – All Fuels - Turbines & Engines etc.)	1.25	7.5%
	Other (High-GWP Gases, Buses, etc.)	0.89	5.2%		**Total**	**16.73**	
	Total	**17.18**		**Buildings**	Residential Combustion - Natural Gas	4.17	41.8%
Power	Cogeneration	4.16	58.8%		Commercial Combustion – Natural Gas	2.33	23.4%
	Power Plants	1.81	25.6%		High-GWP Gases	2.07	20.8%
	Consumption	1.11	15.7%		Other (Fuel Distribution, Natural Gas Leakage etc.)	1.4	14.0%
	Total	**7.08**			**Total**	**9.97**	
Waste	Landfills	1.61	80.9%	**Agriculture**	Livestock	0.58	50.9%
	Domestic Wastewater Treatment	0.24	12.1%		Agricultural Soil Management	0.44	38.6%
	Other (Composting, Industrial Wastewater Treatment, etc.)	0.14	7.0%		Other (Agricultural Equipment, etc.)	0.12	10.5%
	Total	**1.99**			**Total**	**1.14**	

3.3. EMISSIONS BY COUNTY

Table 4 provides a detailed breakdown of the distribution of GHG emissions by county across the BARCAP region.

- Most of the BARCAP region's refineries (industrial sector) and power plants (power sector) are located in Contra Costa County. The demand for natural gas in this county is therefore relatively high (Table 1 in Section 1 – Inventory Scope and Organization) and the county's GHG emissions consequently account for 45% of the BARCAP region's total GHG emissions. The concentration of heavy industry and dependence on natural gas also make Contra Costa County one of the few counties in the BARCAP region where the transportation sector is not the primary source of GHG emissions at the county level.

- Similarly, Solano County's largest source of GHG emissions is the industrial sector due in part to the presence of refinery operations. Emissions from the transportation sector are less than half those from the Industrial sector.

- Alameda, Marin, Napa, San Mateo and Sonoma counties, which have less heavy industry, follow a traditional trend with most of the GHG emissions coming from the transportation (vehicle fuel-use) and buildings (space- and water-heating) sectors. The GHG emissions of these two sectors in these counties are proportionally aligned with vehicle registration counts and the county population (shown in Table 1), respectively.

- The buildings sector emissions are the largest GHG source in San Francisco County exceeding the transportation sector. This is primarily due to the prevalence of commercial real estate and office spaces in the county, which drives up natural gas combustion-related GHG emissions from space- and water- heating, while the high urban density and a robust public transportation network drive down the demand and need for private vehicles in the county.

Table 4: Sector contributions to the BARCAP regional greenhouse gas emissions inventory for each county for 2022.

County	Sector	Emissions ($MMTCO_2e$)	Emissions (% in county)	County	Sector	Emissions ($MMTCO_2e$)	Emissions (% in county)
Alameda	Agriculture	0.12	1.2%	**San Francisco**	Agriculture	0.01	0.2%
	Commercial + Residential	2.48	24.2%		Commercial + Residential	2.03	49.3%
	Electricity Generation	0.69	6.7%		Electricity Generation	0.24	5.8%
	Industrial	0.88	8.6%		Industrial	0.2	4.9%
	Transportation	5.52	53.9%		Transportation	1.61	39.1%
	Waste Management	0.54	5.3%		Waste Management	0.04	1.0%
	Total	**10.24**			**Total**	**4.12**	
Contra Costa	Agriculture	0.22	0.9%	**San Mateo**	Agriculture	0.05	1.0%
	Commercial + Residential	1.91	8.1%		Commercial + Residential	1.59	30.9%
	Electricity Generation	5.48	23.4%		Electricity Generation	0.17	3.3%
	Industrial	12.21	52.0%		Industrial	0.24	4.7%
	Transportation	3.29	14.0%		Transportation	2.73	53.0%
	Waste Management	0.36	1.5%		Waste Management	0.49	9.5%
	Total	**23.46**			**Total**	**5.15**	
Marin	Agriculture	0.17	8.1%	**Solano** (Bay Area Air District portion only)	Agriculture	0.15	2.9%
	Commercial + Residential	0.6	28.7%		Commercial + Residential	0.45	8.6%
	Electricity Generation	0.05	2.4%		Electricity Generation	0.33	6.3%
	Industrial	0.04	1.9%		Industrial	2.89	55.0%
	Transportation	1.08	51.7%		Transportation	1.26	24.0%
	Waste Management	0.14	6.7%		Waste Management	0.18	3.4%
	Total	**2.09**			**Total**	**5.25**	
Napa	Agriculture	0.15	13.4%	**Sonoma** (Bay Area Air District portion only)	Agriculture	0.27	10.5%
	Commercial + Residential	0.27	24.1%		Commercial + Residential	0.64	25.0%
	Electricity Generation	0.04	3.6%		Electricity Generation	0.08	3.1%
	Industrial	0.11	9.8%		Industrial	0.17	6.6%
	Transportation	0.49	43.8%		Transportation	1.2	46.9%
	Waste Management	0.06	5.4%		Waste Management	0.18	7.0%
	Total	**1.12**			**Total**	**2.56**	

3.4. EMISSIONS BY POLLUTANT

Figure 5 provides a breakdown of the GHG emissions by pollutant in million metric tons of CO_2 equivalents for the six economic sectors.

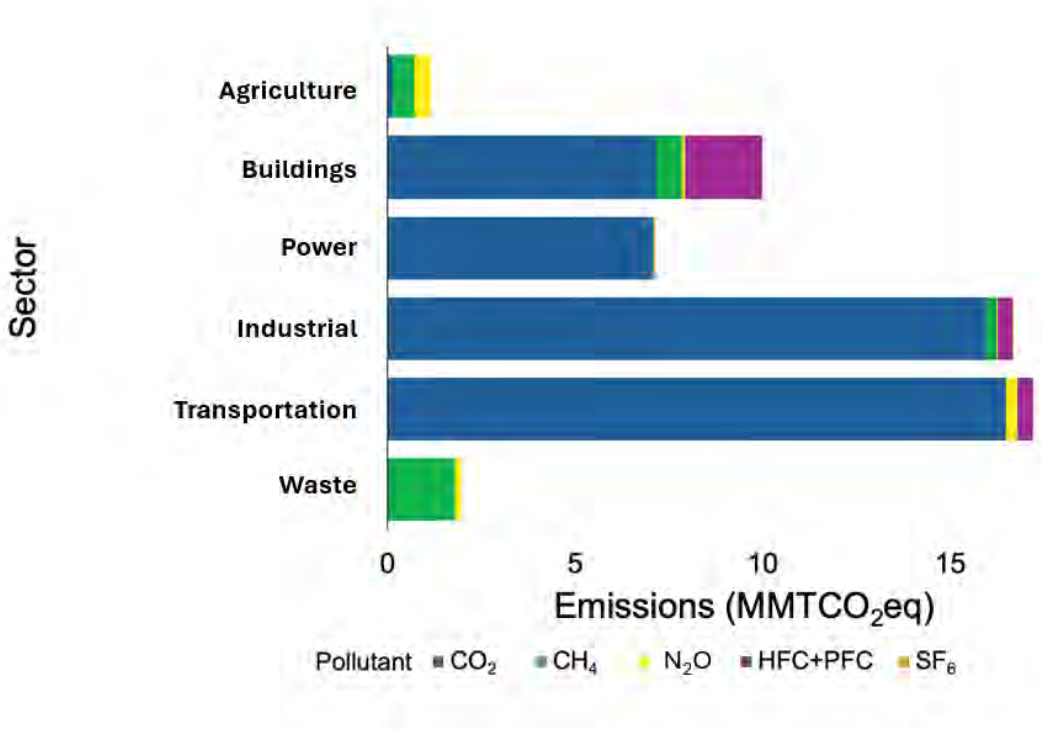


Figure 5: Pollutant contributions by sector to the BARCAP region's greenhouse gas emissions inventory for 2022.

- CO_2 is the predominant GHG pollutant representing 86% of the GHG emissions in the BARCAP region, mostly from combustion of fuels from goods movement and passenger cars in the transportation sector, space heating in the buildings sector, electricity production in the power sector, and petroleum refining in the industrial sector.

- About half of the BARCAP region's CH_4 emissions (>6% of the regional GHG inventory) are emitted from the landfill subsector in the waste sector; however, recent measurement studies have indicated that the real-world emissions may be higher than what is estimated using a bottom-up inventory approach (see Section 4 – Uncertainties and Future Improvements).

- About 45% of all N_2O emissions in the BARCAP region can be attributed to the agriculture sector, mostly due to fertilizer use.

- Nearly 6% of regional GHG emissions are attributed to leakages and fugitive losses of fluorinated high-GWP gases (including HFCs, PFCs, CFCs, HCFCs, and SF_6), a majority of

which occur in the building sector. With the adoption of SB1206 in 2022, HFCs will be phased out in California by 2033, to be replaced with lower-GWP and/or non-GHG options.[27] The regulation will not impact existing appliances that use high-GWP gases as refrigerants, solvents, or aerosols until they are replaced or re-filled (SB1206 prohibits the sale of bulk virgin HFCs while allowing the sale of reclaimed HFCs).

3.5. EMISSIONS TRENDS

Figure 6 presents the change in GHG emissions for each sector over time.

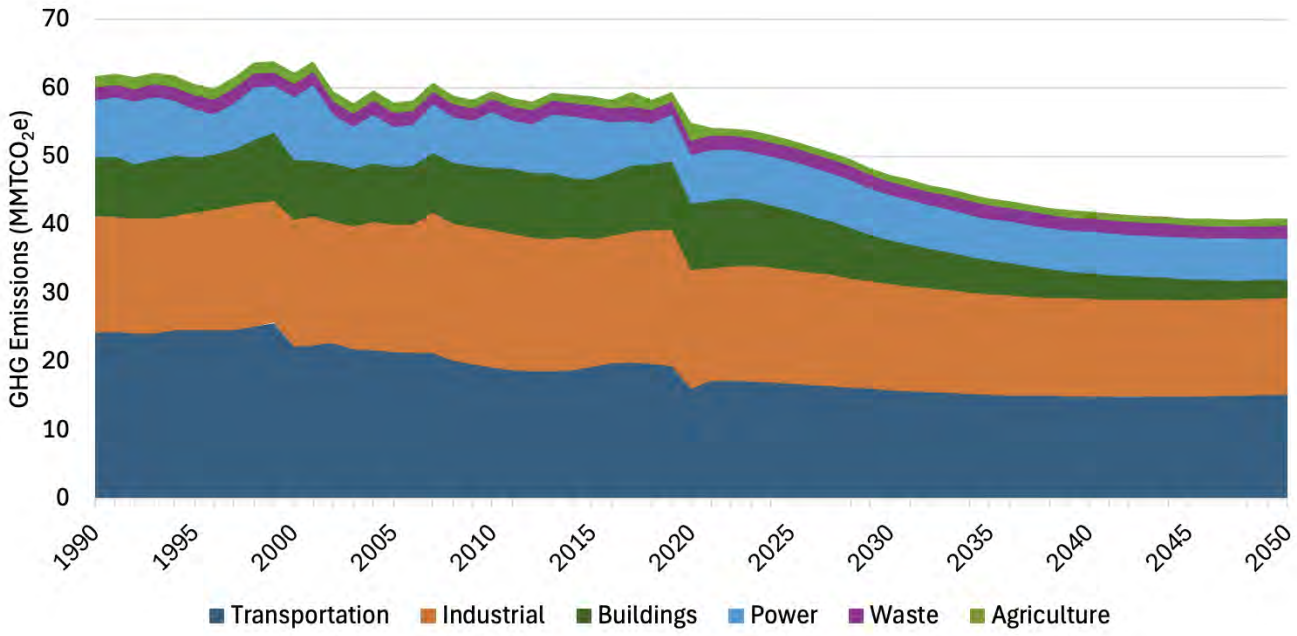


Figure 6: Changes in GHG emissions (in $MMTCO_2e$) by sector over time

Historical Trends

- The BARCAP region's total GHG emissions have dropped from 62.2 $MMTCO_2e$ in 2000 to 54.1 $MMTCO_2e$ in 2022, representing a 13% change, primarily resulting from reduction in emissions in the transportation (-23%), industrial (-9%), and power (-23%) sectors.

- The decline in GHG emissions from the power sector is largely driven by the growing proliferation of renewable energy, which has reduced SFBA's reliance on natural gas for power production. This trend is further strengthened by an increase in residents opting to purchase cleaner and renewable energy through public Community Choice Aggregators.[28]

- Over the past two decades, declining natural gas use in electricity generation has been offset by the increased demand for natural gas use for space- and water- heating in the buildings sector, driven by the BARCAP region's tech-driven economic growth and rising population.

Forecasts

- Projected annual GHG emissions by 2050 are expected to decline in the BARCAP region across major sectors including transportation (-12%), industrial (-16%), and power (-15%), relative to year 2022. This anticipated trend reflects the impact from California's aggressive reduction of fossil fuel reliance and promotion of zero-emission transportation,[29] the state's cap and trade system that disincentivizes and puts a cap on 'allowed' industrial sector GHG emissions,[30] and the continuing decarbonization of the BARCAP region's electric power generation mix as evident from California Energy Commission's retail electricity annual power content label data.[31]

- In comparison, annual GHG emissions of the buildings sector is currently expected to decline by 73% by 2050. This is primarily due to the Air District's Regulation 9 Rule 4 and Regulation 9 Rule 6,[32] which requires new water heaters and furnaces to meet a zero-NO_x emissions standard starting with water heaters in 2027. Currently, only water and space heaters operating on electricity can meet this standard, and thus there are substantial projected GHG co-benefits. Those co-benefits may not be fully realized if alternative natural gas-fired appliances which can meet the zero-NO_X emissions standard are used instead.

- It is expected that high-GWP emissions will decline significantly as state regulations like SB1206 expedite the phase out of HFCs in California by 2033, and result in eventual replacement with lower-GWP and/or non-GHG options.[33]

4. UNCERTAINTIES AND FUTURE IMPROVEMENTS

The BARCAP GHG inventory reflects methodological advancements over the previous base year 2015 inventory.[34] Nonetheless, limitations remain in the latest emissions estimation—ranging from incomplete datasets and uncertain assumptions to high variability in some source categories. Understanding these limitations is essential for accurate interpretation and proper application of emissions data. Below are several illustrative, though not exhaustive, examples of limitations and considerations:

- **Uncertainty in Estimations:** All emissions inventories involve qualitative and quantitative uncertainties. Source categories estimated using top-down scaling methods from statewide or national inventories often have higher uncertainties due to coarse spatial and temporal resolution.

- **Variability in Emission Factors**: Emission factors, particularly for fugitive and leak-related sources, can vary widely due to differences in operational practices and equipment performance. These emission factors are often derived from limited or outdated reference data and research, which may not reflect current field conditions. As a result, emission estimates based on these factors may differ significantly from source test results and may also diverge from estimates generated through other measurement-based methods.

- **Data Lag Between Base Year and Release Year**: The estimation of emissions inventory is always evolving, because there is an inherent lag between the base year chosen for inventory development and its release year, following complete quality assurance and review process. The base year is usually selected to be the year for which the most recent and complete datasets are readily available during inventory development. However, compiling the inventory involves time-consuming processes, including updating methodologies, aggregating and validating data, conducting quality assurance, and preparing supporting documentation. For example, the current inventory estimates for the transportation sector are based on CARB's EMFAC2021 model. CARB has released the updated EMFAC2025 model (May 2025), which incorporates revised vehicle activity data, updated emission factors, and the effects of newly adopted on-road mobile source regulations for the 2021–2024 period. These updates are not reflected in the current inventory yet but will be incorporated in future inventory updates.

- **Forecasting assumptions**: Emission forecasts assume business-as-usual trends that consider routine operations only and regulations currently adopted and in-force. These projections do not account for unexpected emission incidents, socioeconomic disruptions (e.g., pandemics, economic recessions), or future policy statutory or regulatory changes. This is also a notable difference from the approach taken in the previous GHG emissions inventories,[35] which anchored on a scenario that included some "likely" policies.

- **Uncertainties in CH_4 emissions inventories**: Measurement studies performed within the Bay Area and in California[36] indicate that methane emissions from waste management processes (including landfills, wastewater treatment and composting) and from refineries are likely to be

significantly underestimated in the bottom-up inventories. Methodological improvements are needed to more accurately quantify emissions from these subsectors in future inventories.

- **Classification of biogenic CO_2**: In line with CARB protocols,[37] CO_2 emissions from biogenic sources such as ethanol combustion, landfill biogas, or organic decay from composting and landfills are excluded from total anthropogenic GHG emissions. These emissions are estimated and reported as biogenic CO_2; they are considered part of the natural carbon cycle and therefore excluded from the inventory totals. However, CH_4 emissions from these sources are considered anthropogenic and are included in the inventory, as these emissions are assumed to not have occurred if the carbon from the feedstock (or source) had decomposed naturally. Similarly, wildfire CO_2 emissions are also excluded, even if their higher frequency and intensity in the state is indirectly linked to anthropogenic climate change.

- **Scope of electricity generation emissions**: The regional inventory includes direct emissions from electricity generation facilities located within the BARCAP region, regardless of where the electricity is consumed. These emissions fall under the regulatory jurisdiction of the Air District. In contrast, indirect emissions from electricity imported into the region (generated outside the BARCAP region and whether fossil- or non-fossil-based) are excluded from this inventory to maintain a production-based accounting framework aligned with the Air District's regulatory jurisdiction.

- **Scope of landfill subsector emissions**: Similar to the issue of import and export of electricity, it is currently assumed that all waste produced in the BARCAP region is processed and buried at landfills that are located within the Air District's jurisdiction. If a significant amount of the regional waste is transported to landfills outside of BARCAP region boundaries, the landfill GHG emissions total could be quite different from that calculated on a per-capita consumption basis.

- **Aircraft subsector emissions methodology**: The current inventory for the aviation subsector has a base year of 2023 (due to greater representativeness of data following the COVID pandemic) and uses Air District methodologies. However, future inventory updates will align with a standardized statewide model[38] that is under development, improving consistency with statewide planning efforts and potential aviation-related regulatory initiatives.

APPENDIX A1 – SOURCE COMPOSITION OF SECTORS

For the San Francisco Bay Area GHG emissions inventory, six major sectors have been identified based on an economic classification. These sectors include:

- Transportation,
- Industrial,
- Buildings,
- Power,
- Waste, and
- Agriculture.

The sectors are further divided into sub-sectors (see Appendix A2). The definition and source composition of the economic sectors generally align with the USEPA's classification of GHG emissions sources[39] with some exceptions and deviations to account for differences at the regional level. Definitions for each sector are provided below.

Transportation

The emissions in this sector are comprised of direct and indirect combustion, non-combustion, and process emissions, occurring from complex machines including cars, trucks, aircraft, railroads, ships, off-road equipment etc., whose primary objective is to transport people and goods from one place to another. The emission sources in this sector include, but are not limited to, the following:

- Emission from passenger cars, light duty vehicles, medium duty vehicles, and heavy-duty vehicles;
- Emissions from aircraft, marine vessels, and locomotives;
- On-road and off-road emissions sources which act as a residence / home are also included in the transportation sector (e.g., motorhomes, houseboats, RVs);
- Emissions from the use of lubricants to perform maintenance on on-road and off-road mobile equipment; and
- Emissions of high-GWP gases resulting from the use of air conditioners in vehicles and refrigerated transport.

Emission sources not included in this sector are:

- On-road and off-road emissions sources with wheels and/or ability to move if the primary objective is to provide a service, e.g., lawn mowing and garden equipment (included in buildings sector) or tractors (included in agriculture sector);
- Emissions from transportation of natural gas via pipelines and water through water distribution network (this is considered a service to the general population for commercial, residential, and industrial purposes, and both combustion and non-combustion emissions are excluded from this sector),

- Emissions from off-road equipment that pertains to agricultural activities, and from construction, mining, and industrial activities (included in agriculture and industrial sectors, respectively); and
- Fugitive emissions from all kinds of fueling activities of primary sources included in the transportation sector as well as combustion emissions from support equipment for the fueling (and other support) infrastructure. These emissions are accounted for under the buildings sector (e.g., gasoline dispensing facilities, aircraft ground support equipment, etc.).

Industrial

This sector consists of emissions related to the production of goods and raw materials. This sector includes:

- Direct GHG process emissions that originate at the facility, primarily from combustion processes;
- Emissions resulting from chemical reactions in metal, cement, and mineral production; and
- Leaks from industrial processes, equipment, natural gas, and petroleum systems, including that of high-GWP gases.

Exceptions not included in this sector are:

- Indirect emissions that occur off-site but are associated with the facility's use of electricity (these are included in the power sector); and
- Emissions from food processing of agricultural products, for example, ethanol emissions from wineries and emissions from food processing industries, etc. (included in the agriculture sector).

Buildings

This sector includes the following direct emissions from homes, commercial businesses, office spaces, places of business, worship, and congregation, entertainment venues, etc. (excluding those classified as agricultural and industrial activities):

- Direct emissions resulting from fossil fuel combustion for heating, cooling, and cooking needs, for transport and management of waste and wastewater, and leaks of refrigerants from equipment;
- Direct emissions from all maintenance and service equipment, e.g., lawn mowing equipment, leaf blowers, floor cleaning and polishing, etc.; and
- Direct emissions from use of personal products and consumer goods within commercial and residential facilities.

Emissions sources that are not reported in this sector include:

- Indirect emissions produced by burning fossil fuel at a power plant to generate electricity (that occurs offsite) which is meant for consumption in residential and commercial facilities, such as lighting and for appliances (these emissions are included in the power sector);
- Landfill waste emissions (like CH_4) that are generated from organic waste that originated at commercial and residential facilities (these emissions are included in the waste sector);
- On-site wastewater treatment plant emissions of CH_4 and N_2O, or emissions from sewer network (these emissions are included in the waste sector);
- Energy required to produce and transport clean water consumed at commercial and residential facilities (these emissions are included in the power sector);
- Anaerobic digestion and composting emissions of CH_4 at biogas facilities that supply energy/product to commercial and residential buildings and venues (these emissions are included in the waste sector);
- Emissions/sinks from production of construction materials, for example, upstream emissions from production of cement, emissions and sinks from land use changes, etc. (these emissions are included in the industrial sector); and
- Direct emissions from onsite energy combustion and electricity production for energy-intensive warehouses and factories are typically included in the industrial sector.

Power

This sector includes emissions from activities and processes involved in the generation, transmission, and distribution of electricity within the BARCAP region. These emissions are direct and involve combustion of fossil fuels, such as coal, oil, and natural gas, etc., in a centralized power generation plant to produce electricity, or fugitive/leak-related emissions. This definition is independent of whether the produced electricity is consumed within the BARCAP region or imported. Other sources include:

- Emissions from cogeneration facilities producing both heat and power are included in this sector, even if this heat and power is being consumed within the industrial sector;
- Emissions of sulfur hexafluoride (SF_6), which is an insulation chemical used in electricity transmission and distribution equipment; and
- Onsite emissions from non-fossil fuel source generation facilities, including nuclear, and renewable energy sources like hydroelectricity, biomass, and wind.

A source that is not included in this sector is:

- Indirect emissions from the production of electricity imported from outside of the BARCAP region and used in the region. These emissions are not accounted for in the BARCAP GHG inventory.

Waste

This sector includes direct and fugitive emissions from centralized waste management activities that focus on solid waste, wastewater, industrial, and non-hazardous waste. These activities usually occur at municipal solid waste (MSW) landfills, industrial waste landfills, industrial wastewater treatment, publicly owned wastewater treatment plants (POTWs), composting operations, anaerobic digesters, biogas facilities, and can also include processes like manure spreading / application, waste incineration, etc. Other direct emissions included are as follows:

- Direct emissions from combustion activities occurring at waste management facilities to provide heat and power;
- Fugitive emissions from the urban collection network of sewers, waste pipes, manholes, etc.; and
- Emissions from standalone septic systems.

Sources not included in this sector are:

- Waste management emissions occurring outside of the BARCAP region from management of waste originating within the region;
- Direct emissions from on-site waste treatment at commercial and residential facilities (included in the buildings sector);
- Direct emissions from manure management at animal and dairy farms (included in the agriculture sector); and
- CO_2 emissions from the combustion of biomass, which is considered biogenic.

Agriculture

This sector includes direct emissions from all agricultural and farming activities related to crop and livestock production including land and soil management activities, such as application of synthetic and organic fertilizers, the growth of nitrogen-fixing crops, the drainage of organic soils, livestock enteric fermentation, manure management and storage, soil liming, burning of crop residues, and rice cultivation. All on-site combustion-related activities supplying energy to agricultural equipment (like diesel generators and pumps) and for farm-related activities are included. All emissions sources with wheels and/or ability to move are included if the primary objective is to provide a service to the agricultural industry (e.g., airplane fertilizer application, mechanical cotton picker, etc.). Also included in this sector are wildfires over natural lands and forests.

Organization of sources of high GWP fluorinated gases

The group of emission sources termed fluorinated gases or high-GWP compounds are emitted almost entirely from human-related activities. Their primary sources include:

1. Use of substitutes for ozone-depleting substances (referred to as ODSS compounds) - Hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) are ODSS that are considered

replacements for chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) because they do not deplete the stratospheric ozone layer. ODSS are high-GWP gases and contribute to the greenhouse gas effect (CFCs and HCFCs are also high-GWP gases). Example applications include refrigerants, aerosol propellants, foam blowing agents, solvents, and fire retardants.

2. Industrial processes such as aluminum and semiconductor manufacturing - PFCs are produced as a byproduct of aluminum production and are used in the manufacturing of semiconductors. Sulfur hexafluoride (SF_6) is used in magnesium processing and semiconductor manufacturing. Nitrogen trifluoride (NF_3) is used in semiconductor manufacturing. HFC-23 is produced as a byproduct of HCFC-22 production and is used in semiconductor manufacturing.
3. Transmission and distribution of electricity - SF_6 is used as an insulating gas in electrical transmission equipment, including circuit breakers.

The GHG emissions from this group of sources and source categories are not considered as a separate sector, as has been done in the past in the Bay Area region's inventory and in the current statewide California GHG inventory. This is because the prevailing logic for sector-level classification of GHG emissions sources is an economic activity driven classification, rather than a chemical family / pollutant-type based classification. Thus, all source categories associated with this group of emissions are assigned to different sectors based on the following logic:

- ODSS are assigned (under high-GWP gas subsectors) to the buildings, transportation, and industrial sectors based on category hierarchy and end-use information.
- Emissions of PFCs, NF_3, SF_6 and any other F-gas that is used for product manufacturing or metal production are assigned to the industrial sector.

Emissions from SF_6 from electrical transmission equipment are assigned to the power sector.

APPENDIX A2 - INVENTORY SOURCE CATEGORIZATION

Level 1 – Sector	Level 2 – General Process	Level 3 – Subsector
Transportation	Fuel Combustion	Aircraft
Transportation	Fuel Combustion	Buses
Transportation	Fuel Combustion	Heavy-Duty Vehicles
Transportation	Fuel Combustion	Light-Duty Trucks
Transportation	Fuel Combustion	Locomotives
Transportation	Fuel Combustion	Medium-Duty Vehicles
Transportation	Fuel Combustion	Motorhomes
Transportation	Fuel Combustion	Motorcycles
Transportation	Fuel Combustion	Passenger Cars
Transportation	Fuel Combustion	Ships
Transportation	Fuel Combustion	Transportation Refrigeration Units
Transportation	Fugitive & Evaporative	Refrigeration, Air Conditioning, Aerosols
Transportation	Other Combustion	Vehicle Fires
Buildings	Fuel Combustion	Airport Ground Support Equipment
Buildings	Fuel Combustion	Commercial Combustion – Natural Gas
Buildings	Fuel Combustion	Lawn and Garden Equipment
Buildings	Fuel Combustion	Light Commercial Equipment
Buildings	Fuel Combustion	Off-Road Recreational Vehicles
Buildings	Fuel Combustion	Residential Combustion – Liquid Fuel
Buildings	Fuel Combustion	Residential Combustion – Natural Gas
Buildings	Fuel Combustion	Residential Combustion – Wood Burning
Buildings	Fugitive & Evaporative	Fuels Distribution
Buildings	Fugitive & Evaporative	Natural Gas Leakage
Buildings	Fugitive & Evaporative	Refrigeration, Air Conditioning, Aerosols, Foam, Fire Protection
Buildings	Process	Commercial Cooking
Industrial	Fuel Combustion	Non-Refinery Combustion – Natural Gas – Boilers, Heaters & Furnaces

Industrial	Fuel Combustion	Non-Refinery Combustion – Non-Natural Gas – Boilers, Heaters & Furnaces
Industrial	Fuel Combustion	Off-Road Equipment
Industrial	Fuel Combustion	Refinery & Non-Refinery Combustion – All Fuels – Turbines & Engines
Industrial	Fuel Combustion	Refinery Combustion – All Fuels – Boilers, Heaters & Flares
Industrial	Fugitive & Evaporative	Metal Recycling & Shredding Operation
Industrial	Fugitive & Evaporative	Natural Gas Leakage
Industrial	Fugitive & Evaporative	Refrigeration, Air Conditioning, Aerosols, Foam, Fire Protection
Industrial	Fugitive & Evaporative	Semiconductor Manufacture
Industrial	Other Combustion	Structural Fires
Industrial	Process	Manufacturing
Industrial	Process	Petroleum Refining
Power	Fuel Combustion	Cogeneration
Power	Fuel Combustion	Power Plants
Power	Fugitive & Evaporative	Transmission & Distribution
Waste	Fuel Combustion	Landfills
Waste	Other Combustion	Incineration
Waste	Process	Ancillary Processes
Waste	Process	Biosolids Land Application
Waste	Process	Composting
Waste	Process	Domestic Wastewater Treatment
Waste	Process	Industrial Wastewater Treatment
Waste	Process	Landfills
Agriculture	Fuel Combustion	Agricultural Equipment
Agriculture	Other Combustion	Agricultural Burns
Agriculture	Other Combustion	Wildfires
Agriculture	Process	Food Processing
Agriculture	Process	Liming
Agriculture	Process	Livestock
Agriculture	Process	Managed Soils

APPENDIX A3 - REFERENCE DATASETS

Listed below is a list of some major data models, repositories, forecasts, and inventories that have been used to derive and generate emissions estimates for the BARCAP GHG inventory. This list is not exhaustive and represents the most commonly referenced and utilized datasets.

- Association of Bay Area Governments – Plan Bay Area (ABAG, 2021; for regional population, employment and other socio-economic data)
- California Air Resources Board (CARB) GHG Emissions Inventory (CARB, 2024; for statewide GHG emissions data from equivalent emission source categories)
- CARB California Emissions Projection Analysis Model database (CEPAM, 2024; for emissions data on criteria air pollutants from Air District emission source categories)
- CARB 2022 Scoping Plan (CARB, 2022; for forecast and growth profiles)
- CARB EMFAC Web Platform (EMFAC, 2021; for data on On-Road Mobile Sources)
- CARB OFFROAD Database (OFFROAD, 2021; for data on Off-Road Mobile Sources including Rail Transport and Marine Vessels)
- California Department of Finance (CADF, 2024; for data on population and employment statistics)
- California Energy Commission (CEC, 2023b; for residential and non-residential fuel and energy consumption data)
- California Solid Waste Information System (CALSWIS, 2024; for activity data on Waste Management sector)
- Intergovernmental Panel for Climate Change (IPCC, 2014; for Global Warming Potentials)
- United States Department of Agriculture National Agricultural Statistics Service (USDA, 2024; for activity data on Agriculture sector)
- United States Environment Protection Agency– AP-42: Compilation of Air Emissions Factors (USEPA, 2024)

[1] The California Air Resources Board (CARB) maintains the responsibility to prepare, adopt, and update the statewide GHG emissions inventory which starts from year 2000 (https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/ghg_inventory_tsd_00-14.pdf). In 2006, Assembly Bill 32 required that the CARB determine the statewide GHG emissions level in 1990 and approve a statewide GHG emissions limit for year 2020. CARB does not publish a GHG emissions inventory for the years 1990 to 1999. Although, the Air District's GHG emissions inventory extends from year 1990 to 2050, the inventory estimates for years 1990 to 1999 are generally those that have been extrapolated from year 2000 emissions data and have a higher degree of uncertainty. Thus, any discussion on and analysis of inventory trends in this report focuses on emissions data from year 2000 onwards, which also ensures consistency with the statewide GHG emissions inventory. (https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf)

[2] "Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change" *Intergovernmental Panel for Climate Change,* Geneva, Switzerland, 151 pp. Available here: https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf

[3] The Montreal Protocol on Substances that deplete the Ozone layer, Office of Environmental Quality, United States Department of State. https://www.state.gov/the-montreal-protocol-on-substances-that-deplete-the-ozone-layer

[4] The sector naming convention for the BARCAP GHG inventory differ slightly from those used in the Air District's regional GHG inventory that covers the Air Districts full 9-county jurisdiction, although emission sources remain the same under the

corresponding sector names. The BARCAP inventory sector names buildings, power, and waste correspond with the sector names commercial + residential, electricity generation, and waste management in the Air District's regional GHG inventory, respectively. All other sector names are the same in both inventories. The slight difference in naming convention is due to the two inventories serving different purposes, with the BARCAP inventory aligning with the sector focus areas for BARCAP measures.

[5] "California's 2000-2022 GHG Inventory Data," *California Air Resources Board*, 2024. https://ww2.arb.ca.gov/applications/california-ghg-inventory-documentation

[6] "California's 2000-2022 GHG Inventory Data," *California Air Resources Board*.

[7] "Inventory of U.S. Greenhouse Gas Emissions and Sinks," *United States Environmental Protection Agency*, 2025. https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

[8] Available at https://www.baaqmd.gov/en/about-air-quality/emission-inventory/climate-forcing-pollutants

[9] "Inventory of U.S. Greenhouse Gas Emissions and Sinks," *United States Environmental Protection Agency*.

[10] "California's 2000-2022 GHG Inventory Data," *California Air Resources Board*: "Inventory of U.S. Greenhouse Gas Emissions and Sinks," *United States Environmental Protection Agency*.

[11] Regulation 9 Rule 4: Nitrogen Oxides from Natural Gas-Fired Furnaces, *Bay Area Air Quality Management District*. https://www.baaqmd.gov/rules-and-compliance/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces; Regulation 9 Rule 6: Nitrogen Oxides Emissions from Natural Gas-Fired Water Heaters, *Bay Area Air Quality Management District*. https://www.baaqmd.gov/rules-and-compliance/rules/reg-9-rule-6-nitrogen-oxides-emissions-from-natural-gasfired-water-heaters

[12] "Greenhouse Gas Emission Estimates and Draft Forecasts", *Bay Area Air Quality Management District, 2017*. Available: https://www.baaqmd.gov/~/media/files/planning-and-research/plans/2017-clean-air-plan/ghg_emissions_and_forecasts_draft.pdf

[13] "Inventory of U.S. Greenhouse Gas Emissions and Sinks," *United States Environmental Protection Agency*

[14] "California's 2000-2022 GHG Inventory Data," *California Air Resources Board*.

[15] "About Montreal Protocol," *United Nations Environment Programme,* 2025. https://www.unep.org/ozonaction/who-we-are/about-montreal-protocol

[16] "Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change" *Intergovernmental Panel for Climate Change*.

[17] "California's 2000-2022 GHG Inventory Data," *California Air Resources Board*.

[18] California Emissions Projection Analysis Model 2024, CEPAM2019v1.04, *California Air Resources Board*, 2024. https://ww2.arb.ca.gov/applications/cepam2019v1-04-standard-emission-tool. Accessed 2024.

[19] "CARB 2022 Scoping Plan for Achieving Carbon Neutrality," *California Air Resources Board*, December 2022, https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf.

[20] The sector naming convention for the BARCAP GHG inventory differ slightly from those used in the Air District's regional GHG inventory that covers the Air Districts full 9-county jurisdiction, although emission sources remain the same under the corresponding sector names. The BARCAP inventory sector names buildings, power, and waste correspond with the sector names commercial + residential, electricity generation, and waste management in the Air District's regional GHG inventory, respectively. All other sector names are the same in both inventories. The slight difference in naming convention is due to the two inventories serving different purposes, with the BARCAP inventory aligning with the sector focus areas for BARCAP measures.

[21] Annual Power Content Labels, *California Energy Commission*, 2023. https://www.energy.ca.gov/programs-and-topics/programs/power-source-disclosure-program/power-content-label

[22] "Compilation of Air Emissions Factors from Stationary Sources", *United States Environment Protection Agency, 2024*. https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors-stationary-sources

[23] "Regulation for the Mandatory Reporting of Greenhouse Gas Emissions", *California Air Resources Board,* 2019. https://ww2.arb.ca.gov/sites/default/files/classic/cc/reporting/ghg-rep/regulation/mrr-2018-unofficial-2019-4-3.pdf

[24] "Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change" *Intergovernmental Panel for Climate Change*.

[25] Quality Assurance Project Plan for The Bay Area Climate Action Planning Initiative, Grant No..: 98T73201; *submitted on*: 12-27-2023; *approved on*: 01-04-2024; available on request.

[26] "Greenhouse Gas Emission Estimates and Draft Forecasts", *Bay Area Air Quality Management District*.

[27] Senate Bill No. 1206, Skinner, 2022. Hydrofluorocarbon gases: sale or distribution. https://ww2.arb.ca.gov/our-work/programs/sb-1206/about

[28] Community Choice Aggregation in California, 2025. https://cal-cca.org/powered/

[29] "CARB 2022 Scoping Plan for Achieving Carbon Neutrality," *California Air Resources Board.*

[30] "Cap and Trade Program," *California Air Resources Board,* 2018. https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/about

[31] Annual Power Content Labels, *California Energy Commission.*

[32] Regulation 9 Rule 4: Nitrogen Oxides from Natural Gas-Fired Furnaces, *Bay Area Air Quality Management District*. https://www.baaqmd.gov/rules-and-compliance/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces;

Regulation 9 Rule 6: Nitrogen Oxides Emissions from Natural Gas-Fired Water Heaters, *Bay Area Air Quality Management District*. https://www.baaqmd.gov/rules-and-compliance/rules/reg-9-rule-6-nitrogen-oxides-emissions-from-natural-gasfired-water-heaters

[33] Senate Bill No. 1206, Skinner, 2022.

[34] "Greenhouse Gas Emission Estimates and Draft Forecasts", *Bay Area Air Quality Management District*.

[35] "Greenhouse Gas Emission Estimates and Draft Forecasts", *Bay Area Air Quality Management District*.

[36] Jeong et al., 2016. "Estimating methane emissions in California's urban and rural regions using multitower observations." Journal of Geophysical Research Atmospheres. https://doi.org/10.1002/2016JD025404; Duren et al. 2019. "California's methane super-emitters." Nature. https://www.nature.com/articles/s41586-019-1720-3; Guha et al. 2020. "Assessment of Regional Methane Emission Inventories through Airborne Quantification in the San Francisco Bay Area." Environmental Science & Technology. https://pubs.acs.org/doi/abs/10.1021/acs.est.0c01212

[37] California's 2000-2014 GHG Inventory - Technical Support Document, *California Air Resources Board*, 2016. https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/ghg_inventory_tsd_00-14.pdf

[38] California Aircraft Emissions Inventory Draft Technical Documentation for Public Comment, *California Air Resources Board,* 2024. https://ww2.arb.ca.gov/sites/default/files/2024-10/CAI2024%20-%20Main%20Document_Final1021_ada.pdf

[39] Sources of Greenhouse Gas Emissions, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

Appendix B

2022 Natural Working Lands Inventory

March 2026

Bay Area Regional Climate Action Plan



September 2025

2022 Natural Working Lands Inventory Memorandum

Submitted to:

Bay Area Air District,
Planning & Climate Protection
375 Beale St., Suite 600
San Francisco, CA 94105

Submitted by:

ICF Incorporated, L.L.C.
1902 Reston Metro Plaza
Reston, VA 20190

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Glossary of Acronyms and Abbreviations

BARCAP: Bay Area Regional Climate Action Plan

CARB: California Air Resources Board

C: Carbon, as in MT C/ha

CO_2: Carbon Dioxide

CO_2e: Carbon Dioxide Equivalent

CH_4: Methane

EVC: Existing Vegetation Cover

EVH: Existing Vegetation Height

EVT: Existing Vegetation Type

GHG: Greenhouse Gas

Ha: or ha. Hectare; 10,000 square meters

IPCC: Intergovernmental Panel on Climate Change

KSSL: Kellogg Soil Survey Laboratory

MT: Metric Ton

MMT: Million Metric Ton; 1,000,000 MT

N_2O: Nitrous Oxide

NLCD: National Land-Cover Database

NWL: Natural & Working Lands

NSSC: National Soil Survey Center

NRCS: Natural Resources Conservation Service

ROI: Region of Interest

TSD: Technical Support Document

Definitions

Air District Planning Area: The planning area covered in this analysis, which corresponds to the land area that falls under the regulatory jurisdiction of the Bay Area Air District (the Air District). The planning area encompasses the following counties in their entirety: Alameda, Contra Costa, Marin, Napa, San Francisco, and San Mateo. Additionally, the planning area includes portions of Southwestern Solano and Southern Sonoma counties. Note that the Air District's jurisdictional area does cover Santa Clara, which is not covered in this analysis.

BARCAP: An acronym for the Bay Area Regional Climate Action Plan, which is an initiative aimed at reducing greenhouse gas (GHG) emissions and addressing climate change in the Bay Area. This plan is being developed by the Bay Area Air District with funding from the U.S. Environmental Protection Agency's Climate Pollution Reduction Grant program.

BARCAP—Region: The region of interest for this analysis, the counties and partial counties that make up the Bay Area Regional Climate Action Planning (BARCAP) initiative; as opposed to all Bay Area counties. For this purpose of this analysis, this subset of counties does not include any portion of Santa Clara County, which is otherwise a part of the Air District's jurisdiction, but is not included under BARCAP as Santa Clara and San Benito County are writing a separate federally funded climate action plan.

Biomass: The total mass of organic material in a given area or system at a given time. This includes both above- and below-ground live biomass (e.g. roots, trucks, and branches) as well as dead (e.g. litter and dead wood).

Biomass Carbon Stock: The amount of carbon stored in biomass. In this analysis, Biomass Carbon Stock is represented in units of MT carbon per hectare.

California Air Resources Board (CARB): CARB is responsible for safeguarding the public from the adverse impacts of air pollution and creating initiatives to combat climate change. CARB's mission is to enhance and preserve public health, welfare, and environmental resources by efficiently reducing air pollutants, while also taking economic impacts into account. As the primary agency for climate change initiatives, CARB supervises all air pollution control activities in California to achieve and uphold air quality standards that protect health.

Total Carbon Stock: Carbon stock refers to the amount of carbon stored in a given area or system at a given time. This includes carbon stored in living biomass (ex. plants, animals), dead biomass (ex. litter, dead wood), and soil. In this analysis, Total Carbon Stock was calculated by summing Biomass Carbon Stock and Soil Carbon Stock and is represented in units of MT carbon per hectare.

Carbon Density: The carbon stock per unit area or weight.

Climate Smart Land Management: Managing lands to deliver climate benefits. Specific actions or practices may be called climate smart practices, and in the case of agricultural practices may be referred to as climate smart agriculture.

Greenhouse Gas (GHG): Gases that trap heat in the atmosphere (e.g., carbon dioxide, methane, nitrous oxide, and ozone).

gSSURGO: A database of soil data produced and distributed by USDA NRCS in partnership with the National Cooperative Soil Survey (NCSS). The acronym stands for Gridded Soil Survey Geographic Database and is a geodatabase variant of the traditional SSURGO product. gSSURGO is sometimes referred to as SSURGO, as gSSURGO is derived from SSURGO and the data can often be used interchangeably.

Intergovernmental Panel on Climate Change (IPCC): IPCC was established in 1988 by the World Meteorological Organization and the United Nations Environmental Programme. It is a coalition of governments from UN or WMO member states, tasked with delivering regular evaluations of the scientific foundations of climate change, its effects, future risks, and strategies for adaptation and mitigation. Hundreds of specialists examine thousands of research studies to compile assessment reports, which provide thorough summaries of the current understanding of climate change.

Kellogg Soil Survey Laboratory (KSSL): Part of the Natural Resources Conservation Service and is the primary source for soil analytical data for the National Cooperative Soil Survey (NCSS). KSSL conducts comprehensive soil analyses to support soil classification and conservation efforts. The laboratory maintains a vast collection of soil samples and provides critical data for soil health, wetlands, and ecological site conservation.

LANDFIRE: The Landscape Fire and Resource Management Planning Tools is a collaborative program focused on mapping vegetation, fire, and fuel characteristics. Sponsored by the United States Department of the Interior and the United States Department of Agriculture, Forest Service, LANDFIRE generates a detailed, uniform, and scientifically reliable collection of geo-spatial data layers covering the entire United States.

National Land-cover Database (NLCD): A comprehensive program that provides nationwide data on land cover and land cover changes. Managed by the U.S. Geological Survey (USGS), NLCD offers detailed, consistent, and scientifically reliable geo-spatial data layers that help in understanding the landscape of the United States.

National Soil Survey Center (NSSC): Part of the Natural Resources Conservation Service and manages extensive databases on soils, ecology, and botany. The NSSSC provides technical support and data to help landowners and managers conserve natural resources and make informed decisions about soil use and management.

Natural Resources Conservation Service (NRCS): An agency within the United States Department of Agriculture. NRCS provides technical assistance to farmers, ranchers, and other private landowners to help them conserve natural resources. The agency supports voluntary conservation efforts to improve soil, water, air, and habitat quality across the United States.

Map Unit: A term from SSURGO/gSSURGO describing classifications of soils with similar landform and landscape characteristics. The name of the map unit usually includes the major soil type and the slope range of the area described.

ROI: The Region of Interest (ROI) for this analysis is a specifically defined portion of the Bay Area Air District. This ROI encompasses the Bay Area Air District Planning Area, excluding Santa Clara County.

SC Land Cover Class: Refers to the land cover classifications used in the Sonoma County inventory[1], published in October 2023.

Soil Carbon Stock: This refers to the amount of carbon stored in soil. In this analysis, soil carbon stock is estimated as the amount contained in the top 0 to 30 cm of the soil column and is represented in units of MT carbon per hectare.

United States Geological Survey (USGS): A scientific agency within the United States Department of the Interior. USGS conducts research on the landscape, natural resources, and natural hazards of the United

[1] https://sonomacounty.ca.gov/Main%20County%20Site/Administrative%20Support%20%26%20Fiscal%20Services/CAO/Documents/Climate%20Action%20and%20Resiliency/Sonoma-County-Carbon-Inventory-and-Study-with-Executive-Summary.pdf

States. The agency provides valuable scientific data on water, energy, minerals, ecosystems, and the impacts of climate and land-use changes.

Executive Summary

A carbon inventory provides a comprehensive assessment of the amount of carbon stored across a landscape, establishing a baseline of existing carbon stocks and the sequestration potential of natural and working lands (NWL). By offering a snapshot in time, an inventory captures the current state of carbon storage and sequestration, helping to inform land use decisions and climate strategies. Categorizing NWL by land cover type—such as forests, wetlands, and croplands—enables more precise, data-driven insights for local planning.

One key application of a carbon inventory is its ability to quantify and locate carbon at risk of being lost due to disturbance such as wildfires or land conversion. At the same time, it highlights opportunities to enhance carbon sequestration through improved land management practices and targeted climate initiatives.

This analysis represents the first detailed quantitative estimate of carbon stocks and their distribution for the Bay Area Air District (Air District). The resulting inventory will support the Bay Area Regional Climate Action Plan (BARCAP), providing critical data to guide climate-smart land management and NWL greenhouse gas reduction efforts. The inventory's quantitative estimates of carbon stock and biomass was the foundation for modeling the effects of NWL climate change mitigation measures in BARCAP. This memorandum outlines the methodology and key findings from the Bay Area District's 2022 NWL inventory, which was designed to align with the California Air Resources Board's (CARB) 2022 Scoping Plan.[2]

This analysis was conducted for the Air District, creating an inventory of lands located in eight counties: 1) Alameda, 2) Contra Costa, 3) Marin, 4) Napa, 5) San Francisco, 6) San Mateo, 7) Solano, and 8) Sonoma. Notably, the area included in the analysis is limited to the official Air District boundary, which does not include the totality of area in all counties. Furthermore, although included in the complete Bay Area Air District jurisdiction, Santa Clara county was omitted from this analysis by request of the Air District as the Santa Clara County and San Benito County are conducting a parallel and aligned analysis as part of their EPA-funded comprehensive climate action plan effort.

As of 2022, the counties that make up the region of interest (ROI) subset of the Bay Area Air District held a total of approximately 92 MMT C total carbon stock, as reflected in the totals row of Tables 1 and 2.

[2] https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp_1.pdf

When categorized by land cover type, forests contain the highest carbon density (Table 1). At the county level, Napa County has the highest carbon density among all the counties in the Bay Area Regional Climate Action Plan (BARCAP) counties (Table 2).

Table 1. 2022 Total Carbon Stock by Land Cover Class.

The data in this table only includes the area (counties and partial counties) under Bay Area Air District jurisdiction, omitting Santa Clara County.

Land Cover Class	Area in Hectares	Biomass Carbon Stock in MT C	Soil Carbon Stock in MT C	Total Carbon Stock in MT C	Total Carbon Stock in MT C per Hectare
Barren	3,811	9,238	130,149	139,387	37
Orchard	4,133	234,565	142,928	377,494	91
Vineyard	40,909	163,636	1,509,421	1,673,057	41
Cultivated and Field Crops	25,826	167,420	2,230,023	2,397,443	93
Pasture and Hay	30,989	197,012	2,373,114	2,570,126	83
Open Water	49,452	--	3,668,746	3,668,746	74
Shrub/Scrub	77,799	2,701,805	2,568,656	5,270,461	68
Wetland	65,094	1,899,193	6,733,661	8,632,855	133
Grassland/ Herbaceous	244,303	1,612,456	8,684,481	10,296,937	42
Development	304,801	893,301	9,759,188	10,652,489	35
Forest	266,268	37,001,485	9,654,650	46,656,135	175
Total	*1,113,384*	*44,880,113*	*47,455,018*	*92,335,131*	*83*

Table 2. 2022 Total Carbon Stock by BARCAP—Region.

The data in this table only includes the area (counties and partial counties) under Bay Area Air District jurisdiction, omitting Santa Clara County.

BARCAP – Region	Area in Hectares	Biomass Carbon Stock in MT C	Soil Carbon Stock in MT C	Total Carbon Stock in MT C	Total Carbon Stock in MT C per Hectare
San Francisco	12,227	67,555	158,842	226,397	19
Solano	98,304	1,168,051	7,402,503	8,570,553	87
Alameda	192,639	5,517,260	5,927,448	11,444,708	59
Sonoma	159,680	5,387,751	6,594,216	11,981,967	75
San Mateo	117,769	8,458,669	3,846,532	12,305,201	104
Marin	135,530	8,796,059	5,371,978	14,168,036	105
Contra Costa	193,136	4,601,826	10,270,398	14,872,224	77
Napa	204,099	10,882,942	7,883,101	18,766,043	92
Total	*1,113,384*	*44,880,113*	*47,455,018*	*92,335,131*	*83*

Methodology

Overview of Bay Area Air District Inventory Methods

The natural and working lands (NWL) carbon stock within the Bay Area Air District (Air District). was calculated for the 2022 inventory year. This analysis utilized LANDFIRE[3] land cover classification raster data, which was matched with biomass carbon stock estimates from the 2018 California Air Resources Board (CARB) inventory[4] for each land cover class. This matching was based on alignment between the two datasets on the following three metrics: Existing Vegetation Type (EVT), which represents the distribution of vegetation types; Existing Vegetation Height (EVH), which indicates the average height of dominant vegetation; and Existing Vegetation Canopy Cover (EVC), which refers to the percentage of ground covered by tree and shrub canopy. The resulting dataset produced a spatially explicit map of biomass carbon stock by carbon pool across the Bay Area Air District (see Figure 1A). Furthermore, this analysis incorporated measurements of soil carbon stock throughout the Air District, utilizing raster data from gSSURGO[5], and added those values to the values of biomass carbon stock throughout the region to produce estimates of total carbon stock (see Figures 1B and 1C). In short, biomass carbon stock (Figure 1A) + soil carbon stock (Figure 1B) = total carbon stock (Figure 1C).

As described further in the sections below, the Air District inventory is aligned with state and local analyses. Differences in methodology are described, and are due to application of expert judgement, data availability given the large 8-county scale of the BARCAP—Region, and knowledge that the State of California will soon be updating their methodology for carbon stocks on a statewide level, though finalized results of the inventory was not available at the time of conducting this analysis (State carbon inventory results and methodology are projected to be available in late winter of 2025).

Assumptions and Interpolations

All unique combinations of EVT, EVC, and EVH that do not have an associated biomass carbon stock value were interpolated with a value of total biomass multiplied by the coefficient 0.55 as per FAO guidelines[6]. This coefficient is a widely used standard for converting biomass carbon stock to total biomass (above- and below-ground). The following land cover classes did not have total biomass measurements from CARB, as CARB assumes all annually harvested areas to have a total biomass of 0: Development, Cultivated and Field Crops, Orchard, Pasture and Hay, Vineyard. For these classes, the FAO interpolation was employed.

In less than 2% of the land cover area, missing data or mismatches occurred between EVT, EVC, and EVH classifications from the LANDFIRE and CARB datasets that could not be corrected using the FAO guideline. In these cases, values were interpolated using expert judgment and using two primary methods: (1) adjusting missing EVT, EVC, or EVH values to the most similar neighboring classification (e.g., increasing herbaceous cover from 25% to 55% while maintaining the same EVT classification) or (2) redefining an EVT without data to align with a similar EVT with available data (e.g., using biomass and

[3] https://www.landfire.gov/
[4] https://ww2.arb.ca.gov/sites/default/files/2025-02/CARB-2018-NWL-Carbon-Inventory-Report.pdf
[5] https://www.nrcs.usda.gov/resources/data-and-reports/gridded-soil-survey-geographic-gssurgo-database
[6] https://www.fao.org/4/y5490e/y5490e07.htm

carbon stock values from Mixed Conifer Forests to estimate values for Developed Mixed Conifer Forests).

Furthermore, in approximately 7% of the land cover area, gSSURGO did not contain estimates of soil carbon stock. Roughly 3% of the land cover area missing estimates of soil carbon stock could be assumed to be equal to 0. This occurred mostly with soil types describing water (including open water, dam, etc.), since gSSURGO does not quantify soil carbon underlying water, but also in quarries, pits, or other broken land. For the remaining 4% of land cover area, this analysis manually interpolated those regions by assigning the values of soil carbon stock from the closest matching map unit (e.g., replacing the null SOC value from "Rock outcrop-Xerorthents complex, 50 to 75 percent slopes" with the value of SOC from the closest matching map unit category of "Rock outcrop-Kidd complex, 50 to 75 percent slopes").

Despite gSSURGO not containing any measurements of soil carbon stock from soils underlying water, the land cover classification 'Open Water' is estimated as containing 3,668,746 MT C/ha (over 49,452 hectares in the ROI) from soil carbon. This is because the gSSURGO soils dataset did not map exactly to the LANDFIRE classifications. For example, a particularly wet marshland may be grouped into "Water" using LANDFIRE data, because of the high degree of wetness that is likely to mislead spectral imagery classification. However, gSSURGO uses different underlying data, including ground truthing, which may lead to the of that same area as "Wetland". Furthermore, the LANDFIRE dataset has a resolution of 30 m^2 and gSSURGO has a resolution of $10m^2$, meaning that the gSSURGO dataset has a finer resolution to differentiate land cover boundaries. Pixels from LANDFIRE may be classified as 'Open Water', but gSSURGO has a higher resolution and is able to quantify the soils alongside rivers, creeks, and other water bodies at a finer granularity (higher precision). These slight spatial margins are critically important and can lead to the large amount of carbon noted above. Since the carbon in soils alongside water bodies tends to be highly organic in the ROI, the category of 'Open Water' contains lots of carbon-rich soil, skewing this category higher than expected.

Figure 1A, 1B. Biomass Carbon Stock in MT C/ha (left); Soil Carbon Stock in MT C/ha (right)

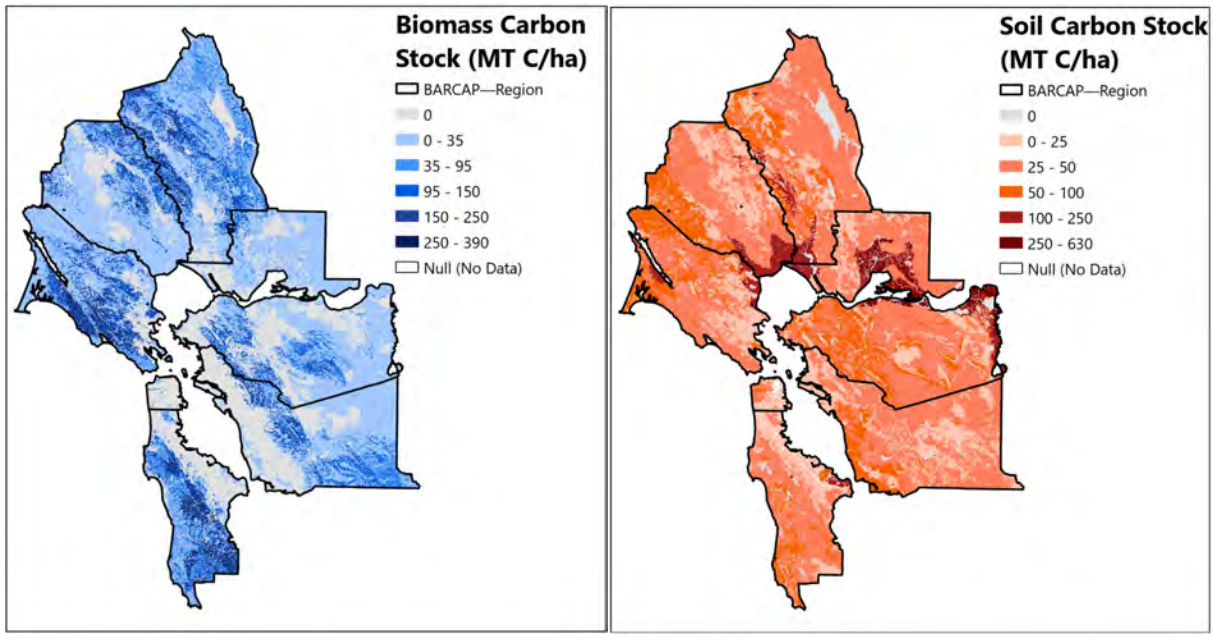
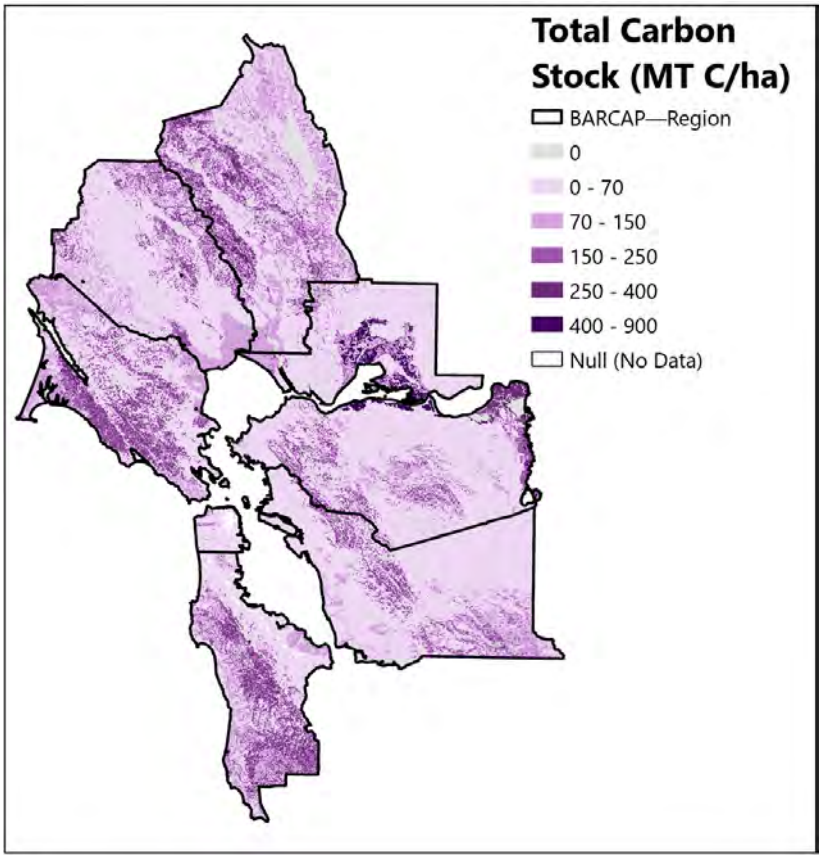


Figure 1C. Total Stock in MT C/ha

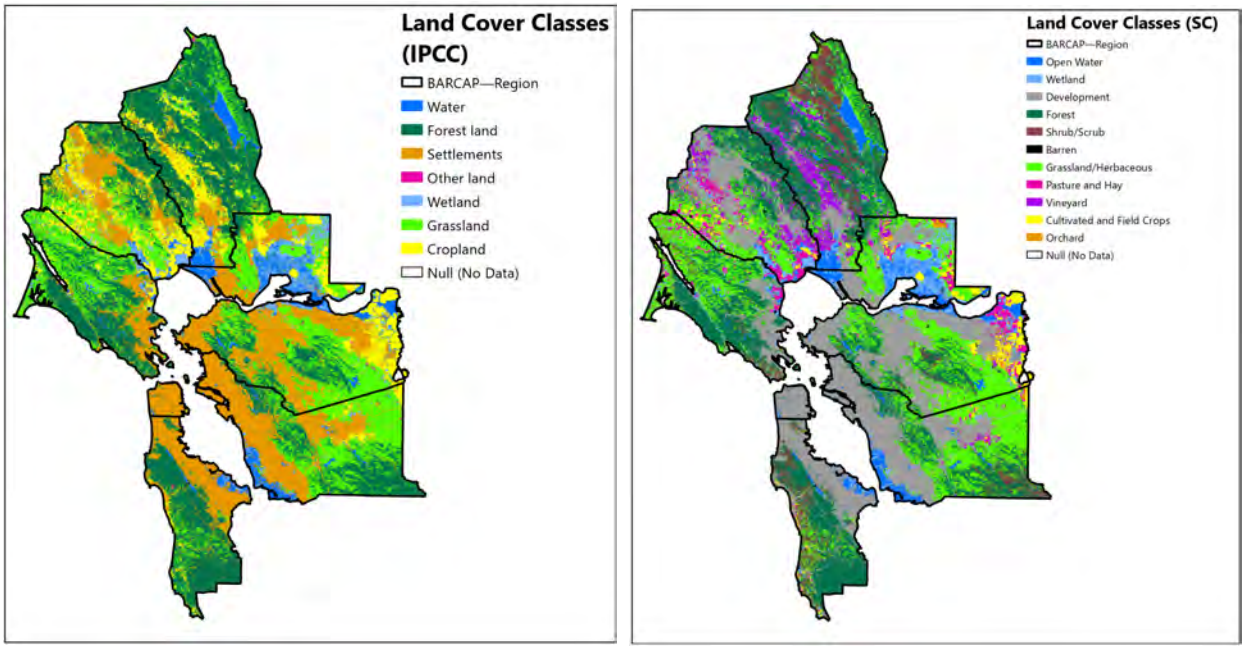


After determining carbon stocks; additional maps were created to illustrate land cover classifications to align with both international (IPCC) and local (Sonoma County) frameworks, as shown in Figures 2A and

2B. The IPCC classifications were already embedded within the California Air Resources Board (CARB) dataset, thus Figure 2A reflects the application of these classifications across the region of interest (ROI).

The Sonoma County classification in this analysis represents manual groupings of Existing Vegetation Type (EVT) from LANDFIRE that were understood to best align with Sonoma County land cover definitions. In cases of uncertainty surrounding the dominant vegetation type in a mixed-vegetation EVT, documentation originally used to establish EVTs in LANDFIRE[7] informed the best possible classification. The original classification methodology, outlined in detail in Appendix B of the 2023 Sonoma County Carbon Inventory and Sequestration Potential Study[8] could not be replicated in this analysis due to data availability constraints. See Appendix Table 1 for a full list of Sonoma County land cover definitions and the accompanying definitions used in this analysis; and see Appendix Table 2 for the result of that classification work.

Figure 2A, 2,B. A. Land Cover Classes, IPCC Classifications (left); B. Land Cover Classes, Sonoma County Classifications (right)



[7] https://www.natureserve.org/sites/default/files/pcom_2003_ecol_systems_us.pdf
[8] https://sonoma-county.legistar.com/LegislationDetail.aspx?ID=6399747&GUID=42EF9CFA-1B23-4B80-BE5C-6DC2B882A484

Relation to the CARB NWL Inventory and Scoping Plan

The most recent California statewide inventory was published by CARB[9] in 2018. CARB's inventory utilized a combination of remotely sensed, survey, and field-based datasets to create a comprehensive, statewide assessment of biomass and soil carbon stocks. The foundation of this inventory was the LANDFIRE[10] dataset, which provided consistent, wall-to-wall land cover and vegetation data for the State of California. To ensure accuracy and alignment with international standards, CARB processed this data according to Intergovernmental Panel on Climate Change (IPCC) guidelines, and integrated ground-based measurements with remote sensing technology to monitor changes in land cover and biomass carbon stocks over time.

The LANDFIRE-based database of biomass carbon stocks from CARB quantifies above- and below-ground biomass carbon, including but not limited to living trees, roots, shrubs, standing dead trees, and leaf litter, but does not account for soil carbon. As in the CARB inventory, this analysis incorporated estimates of soil carbon stocks using raster data from gSSURGO. A detailed description of all data sources, models, and methodologies used in the CARB inventory can be found in the 2018 CARB Natural and Working Lands Inventory Technical Support Document (TSD)[11] and a table of all data sources can be found replicated below, in Table 3.

This inventory utilized the CARB methodology and database of carbon stock densities, based on the previously mentioned LANDFIRE datasets, as the foundation to produce spatially explicit carbon stock estimates in the Bay Area Air District for inventory year 2022. Inventory improvements and region-specific refinements that were made to this inventory include:

- Mapping LANDFIRE categories not included in the dataset delivered by CARB to carbon stocks in the existing datasets based on updated LANDFIRE classification manual and expert judgement,
- Adding in soil carbon stock estimates from missing regions based on closest available data by map unit, and
- Producing grouped land cover classifications that both align with CARB's IPCC mapping and the region-specific land cover classifications identified by Sonoma County, as detailed in Section 3.1.

[9] https://ww2.arb.ca.gov/sites/default/files/2025-02/CARB-2018-NWL-Carbon-Inventory-Report.pdf
[10] https://www.landfire.gov/
[11] https://carbstage.arb.ca.gov/resources/documents/2018-natural-and-working-lands-carbon-inventory-technical-support-document

Table 3. Data Used for the California Statewide CARB Inventory (2018).

Inventory Method	Tier	Data	Publication Frequency	Latest Year
Forest and Other Natural Lands	Tier 3	USFS FIA Data	Annual	2016
		LANDFIRE	2 years	2014
		MODIS	Annual	2012
Wetland	Tier 2	Tier 2 San Francisco Estuary Inst.	Undefined	2016
		gSSURGO	Annual	2016
		LANDFIRE	2 years	2014
Cropland Biomass	Tier 3	Digital Globe	Varies *	2018
		LANDSAT	16 days	2018
		Google Street	~5 years for rural areas*	2018
		USDA NASS Census	5 years	Census - 2012
		USDA NASS Survey	1 year	Survey - 2017
		USDA Cropscape	Annual	2017
Urban Forest Biomass	Tier 3	USDA NAIP data	Usually every 2 years	2016
		USGS DOQQ data	No longer refreshed*	1999
		USFS Urban FIA data	5 years	2015
		UFORE	Not refreshed*	Varies (2003-2015)
		Municipal tree inventories	Varies / Decadal*	Varies (2003-2015)
Soil Carbon	Tier 3 for croplands outside of the Delta Tier 1 for all other lands	DayMET	Annual	2017
		NASS Census	5 years	2012
		NASS Survey	Annual	2017
		LANDFIRE	2 years	2014
		gSSURGO	Annual	2016
		National Atmospheric Deposition Program	Annual	2017
		California Ag Commissioner	Annual	2017
		SoilGrids	Annual	2017

*Not needed for annual/biannual refresh

Relation to the Contra Costa County Inventory

The most recent Contra Costa inventory[12], which is relevant as like Sonoma County, it is also a recent local analysis of carbon stocks in the BARCAP—Region, published in October 2023, calculated carbon stocks using similar methods to those employed in this inventory of the Bay Area Air District. The Contra Costa inventory similarly leveraged the CARB methodology and LANDFIRE carbon density data to estimate carbon stocks from Natural Lands (Forest, Shrubland, Grassland, etc.), and Agricultural Lands (Pasture and Hay, Orchards, Cultivated Crops, and Vineyards), along with gSSURGO raster data to estimate soil carbon stocks.

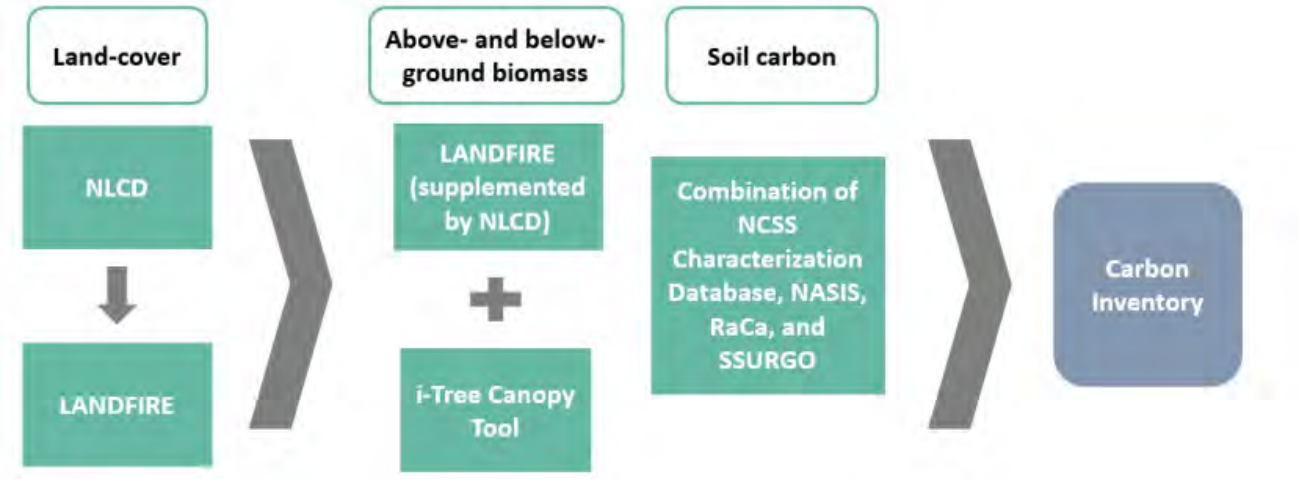
Unlike in this inventory, the Contra Costa inventory adjusted land cover classifications (originally from LANDFIRE) using satellite imagery from the National Land-Cover Database (NLCD). This additional imagery for categorization was employed after the developers of the Contra Costa inventory identified inaccuracies in shrubland classification from the LANDFIRE dataset in Contra Costa (ex. grassland/herbaceous areas categorized as shrub/scrub). Additionally, in another deviation from the Air District Inventory, Contra Costa sourced urban forest density data, which was used to calculate development carbon stock, from USDA Forest Service i-Tree Canopy (i7), rather than using the forest canopy data provided by LANDFIRE in the EVC layer.

The Contra Costa inventory similarly supplemented SSURGO data with estimates of soil carbon stock from a wide range of datasets (NCSS Characterization Database from the National Soil Survey Center (NSSSC)/Kellogg Soil Survey Laboratory (KSSL); National Soil Information System (NASIS) from USDA National Resource Conservation Service (NRCS); and Rapid Carbon Assessment (RaCA) from USDA NRCS). Instead of manually interpolating missing areas from SSURGO, as in this analysis, Contra Costa created a collective database of soil carbon stock measurements from all available data sources and interpolated that dataset, along with SSURGO, to produce wall-to-wall soil carbon stock estimates. All data used in establishing the Contra Costa inventory is illustrated below, in Figure 3.

There are key deliverable differences that differentiate this analysis from the Contra Costa analysis. In Contra Costa, land cover was classified using LANDFIRE data, as in this analysis, but Contra Costa invested additional resources in categorizing inaccuracies in the LANDFIRE (namely shrubland and grassland in the county) using NLCD data, as well incorporating the i-Tree Canopy Tool for urban forest density estimates, along with desktop ground truthing. In contrast, this analysis relied solely on LANDFIRE data for estimates of biomass carbon stock, with manual interpolation to proxy missing areas. Additionally, Contra Costa incorporated estimates of soil carbon from gSSURGO and various additional data sources, whereas this analysis solely accounted for soil carbon using gSSURGO data. Like this final inventory, the final Contra Costa Carbon inventory product is classified according to Existing Vegetation Type from LANDFIRE and NLCD, see Appendix Table 1 for the definitions and differences from this analysis. This classification ensures continuity between the two inventories.

[12] https://www.contracosta.ca.gov/DocumentCenter/View/79768/Healthy-Lands-Healthy-People-Final-Report

Figure 3. Data Used for the Contra Costa County Inventories (2001 and 2021). Copied from the 2023 Contra Costa County inventory.



Relation to the Sonoma County Inventory

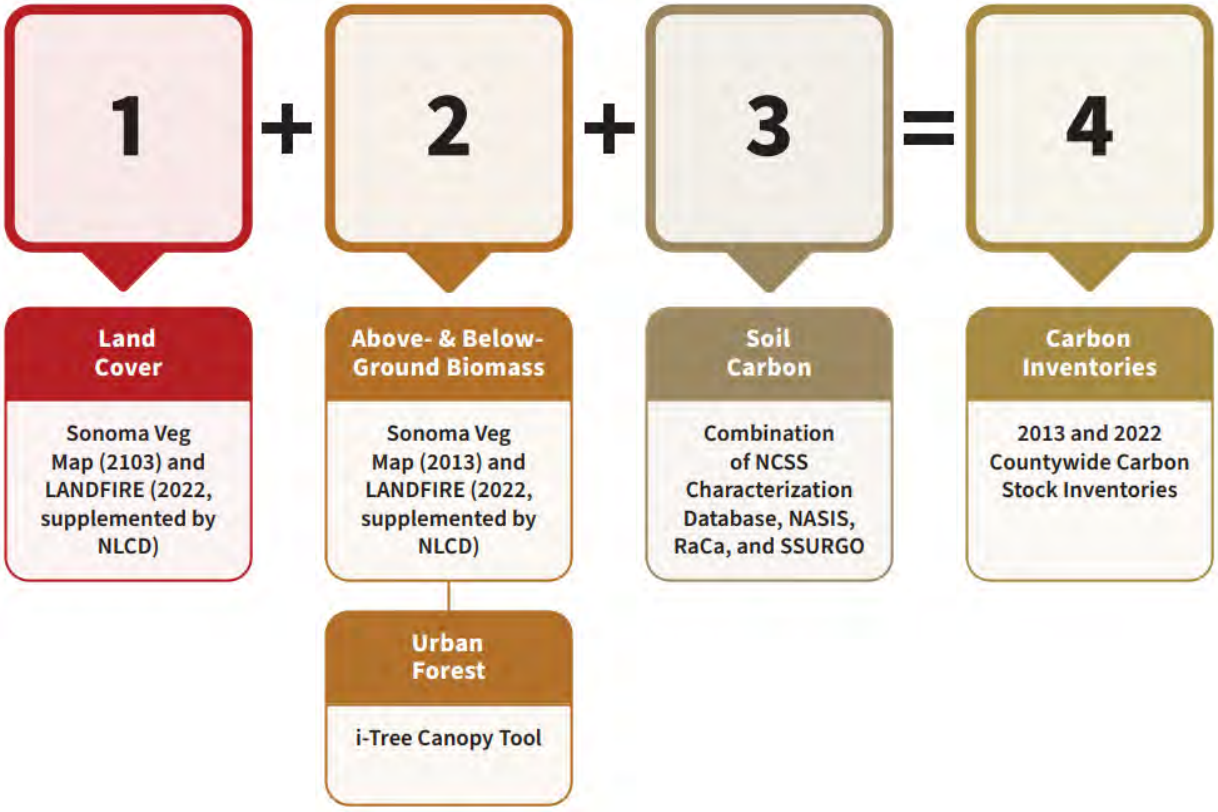
The most recent Sonoma County inventory[13], published in October 2023, calculated carbon stocks using similar methods to those employed in this inventory of the Bay Area Air District that established land cover types from LANDFIRE data, measured carbon within each land cover type, then summed the amount of carbon by land cover type.

Sonoma County employed a similar methodology to CARB and this analysis in using LANDFIRE to calculate above- and below-ground biomass as part of the total carbon stock calculation. However, unlike in this inventory, and similarly to the Contra Costa inventory-- Sonoma County combined multiple data sources to create the final biomass carbon stock estimations (see Figure 4). Like in this Air District inventory, Sonoma County estimated values for soil carbon using SSURGO raster data. Unlike in this inventory, Sonoma County employed additional datasets (the NCSS Characterization database, NASIS, RaCa) to create a database for further soil carbon stock estimation via interpolation. All data used in establishing this inventory is illustrated below, in Figure 4.

There are key deliverable differences that differentiate this analysis from the Sonoma County analysis. Primarily, in 2013, Sonoma County used the Sonoma Veg Map for land classification, which is unique to the county. This produced deliverables and results that could not be replicated by any other analysis. In 2022, Sonoma County classified land cover using LANDFIRE data, as in this analysis, but Sonoma County invested additional resources in categorizing inaccuracies in the LANDFIRE (using NLCD for additional satellite imagery, similar to the Contra Costa inventory). Additionally, Sonoma County incorporated estimates of urban tree density (and associated carbon) from i-Tree, rather than consistently utilizing the LANDFIRE EVC, EVH, and EVT layers. Furthermore, Sonoma County quantified soil carbon using SSURGO raster data and various other data sources, detailed above, whereas this analysis consistently leveraged gSSURGO. Like this analysis, the final Sonoma County inventory product from 2022 is classified according to Existing Vegetation Type from LANDFIRE and NLCD, see Appendix Table 1 for the definitions and differences from this analysis. This classification facilitates continuity and comparison between the two inventories.

[13] https://sonomacounty.ca.gov/Main%20County%20Site/Administrative%20Support%20%26%20Fiscal%20Services/CAO/Documents/Climate%20Action%20and%20Resiliency/Sonoma-County-Carbon-Inventory-and-Study-with-Executive-Summary.pdf

Figure 4. Data Used for the Sonoma County Inventory (2013 and 2022). Copied from the 2023 Sonoma County inventory.



Results and Discussion

To better understand land cover distribution throughout the ROI, land cover area was summed by BARCAP—Region proportionally to area, Figure 3, and independently of area, Figure 4. This illustrates the dominant land cover classification in and among each county (or partial county; as BARCAP—Region), respectively. A discussion of carbon stocks, disaggregated by SC land cover type, follows below.

Figure 5. Percent Land Cover by BARCAP—Region.

The data in this figure only includes the area (counties and partial counties) under Bay Area Air District jurisdiction, omitting Santa Clara County.

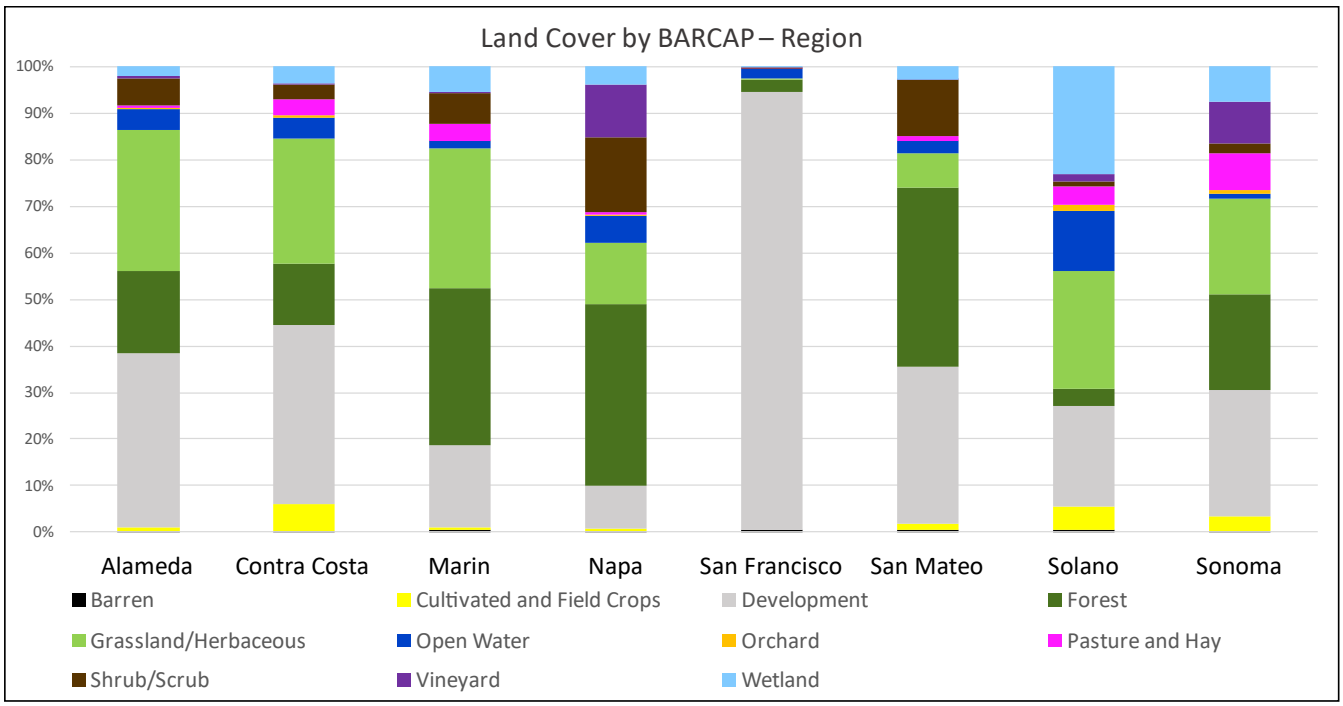


Table 4. Percent Land Cover Area by BARCAP—Region.

The data in this table only includes the area (counties and partial counties) under Bay Area Air District jurisdiction, omitting Santa Clara County.

Land Cover Classes (SC) Area Percentages by BARCAP—Region												
	Barren	Cultivated and Field Crops	Development	Forest	Grassland/ Herbaceous	Open Water	Orchard	Pasture and Hay	Shrub/ Scrub	Vineyard	Wetland	Total
Alameda	9%	6%	24%	13%	24%	18%	11%	3%	14%	3%	6%	17%
Contra Costa	12%	43%	24%	9%	21%	17%	29%	21%	8%	2%	11%	17%
Marin	19%	3%	8%	17%	17%	5%	1%	15%	12%	0%	12%	12%
Napa	21%	3%	6%	30%	11%	24%	4%	4%	43%	56%	12%	18%
San Francisco	1%	0%	4%	0%	0%	1%	0%	0%	0%	0%	0%	1%
San Mateo	15%	6%	13%	17%	4%	6%	3%	3%	18%	0%	5%	11%
Solano	14%	19%	7%	1%	10%	26%	30%	12%	1%	3%	35%	9%
Sonoma	8%	20%	14%	12%	13%	4%	21%	41%	4%	35%	19%	14%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Figure 6. Land Cover Area by BARCAP—Region.

The data in this figure only includes the area (counties and partial counties) under Bay Area Air District jurisdiction, omitting Santa Clara County.

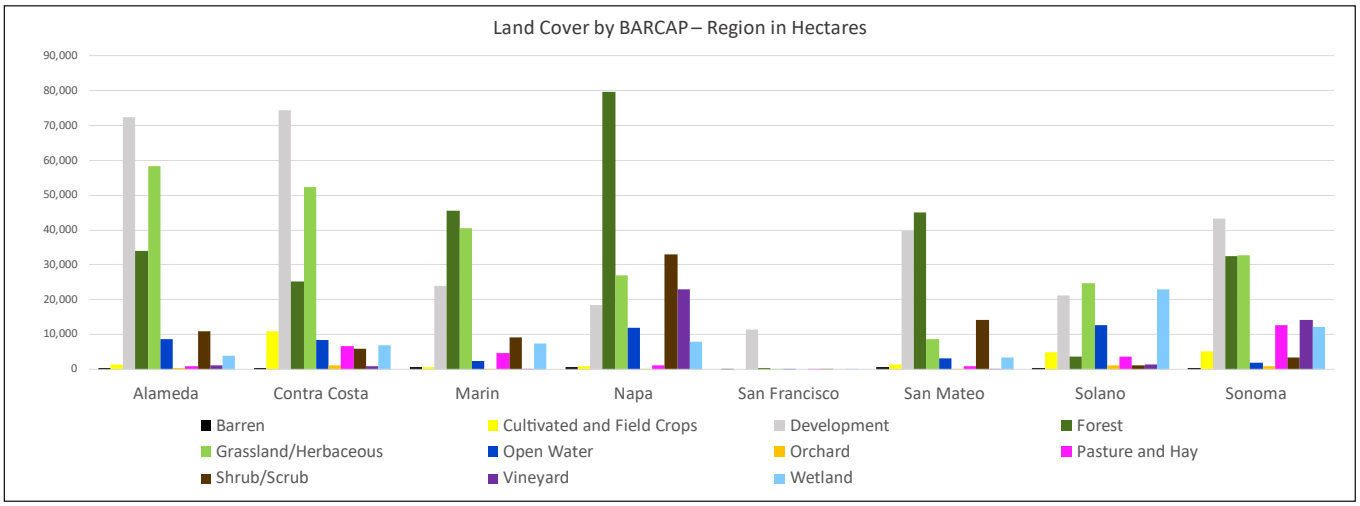


Table 5. Land Cover Area by BARCAP—Region.

The data in this table only includes the area (counties and partial counties) under Bay Area Air District jurisdiction, omitting Santa Clara County.

Land Cover Classes (SC) Area in Hectares by BARCAP—Region												
	Barren	Cultivated and Field Crops	Development	Forest	Grassland/ Herbaceous	Open Water	Orchard	Pasture and Hay	Shrub/ Scrub	Vineyard	Wetland	Total
Alameda	335	1,520	72,390	33,921	58,240	8,674	462	942	10,885	1,209	4,061	192,639
Contra Costa	468	11,058	74,339	25,212	52,210	8,352	1,189	6,651	5,836	828	6,993	193,136
Marin	743	753	23,899	45,599	40,560	2,330	40	4,696	9,262	102	7,546	135,530
Napa	786	882	18,514	79,705	26,952	11,896	184	1,166	33,093	22,979	7,941	204,099
San Francisco	50	0	11,495	330	22	263	0	1	22	0	44	12,227
San Mateo	567	1,462	39,810	45,138	8,769	3,169	117	986	14,222	83	3,446	117,769
Solano	549	4,987	21,106	3,748	24,745	12,732	1,257	3,808	1,113	1,394	22,866	98,304
Sonoma	313	5,164	43,249	32,614	32,805	2,036	884	12,740	3,365	14,314	12,197	159,680
Total	3,811	25,826	304,801	266,268	244,303	49,452	4,133	30,989	77,799	40,909	65,094	1,113,384

Development

San Francisco is dominated by developed, urban land (Figure 5). Over such a small land area, San Francisco could be an ideal choice to implement a climate-smart land management strategy for developed areas, as it would be targeted towards the dense development in the area. Alternatively, Contra Costa and Alameda have the most developed land by area (Table 5) and therefore have the most in which to invest.

The 2022 CARB Scoping Plan[14] recommends an increase in urban forestry investment by 200% above current levels, and tree watering that is 30% less sensitive to drought. In BARCAP, this could be accomplished through urban greening initiatives, which target an increase in urban canopy cover through improved maintenance of existing trees or planting of new trees. CARB Scoping Plan suggests an increase in urban forestry investment annually by 20 percent, relative to business as usual, which could be supported through BARCAP.

Forest

Napa is dominated by forest and contains the most forest of any county (Figure 6, Table 5). This large expanse of forested area, which is also the highest of the land cover classifications in both MT carbon per hectare (Table 1), can be leveraged in implementing climate-smart forestry strategies.

This is especially critical, given that the 2022 CARB Scoping Plan prescribes treating at least 2.3 million acres statewide of forests, shrublands/chaparral, and grasslands with regionally specific, climate-smart management strategies[15]. Given the large risk of wildfire in these areas, the Scoping Plan recommends implementing climate-smart forest management strategies in line with the California Wildfire and Forest Resilience Action Plan[16]. In forests found throughout the BARCAP—Region, this could be fulfilled through engaging in Forest Slash Treatment (CPS 384) or prescribed burning, to reduce fuel loads and limit wildfire risk.

Moreover, the Scoping Plan recommends no land conversion to any other class from forests. Protecting existing forested land from conversion to agricultural or developed land in each county (or partial county) within the BARCAP—Region is in clear alignment with the CARB Scoping Plan, due to the carbon sequestration sustained by maintaining carbon-dense land cover. In BARCAP, this could be implemented through practices like Native Oak Restoration/Silvopasture (CPS 381) or planting of riparian forest buffer.

Wetland

Solano County, for the purposes of this analysis meaning the southwestern portion from this ROI, has the most wetlands in the BARCAP—Region. Wetlands are the second most carbon-dense of the land cover classifications in MT per hectare of carbon (Table 1) and can be targeted to meet carbon sequestration goals.

The 2022 CARB Scoping Plan recommends the restoration of approximately 15 percent of all Sacramento–San Joaquin River Delta (Delta) wetlands, summing to 60,000 acres, by 2045. This emphasis on Deltaic wetland management in the Scoping Plan is due to the enormous carbon sink capacity of wetlands and the risk of carbon emissions from wetlands under certain conditions. Wetlands function as

[14] https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp_1.pdf
[15] https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp_1.pdf
[16] https://wildfiretaskforce.org/wp-content/uploads/2022/12/californiawildfireandforestresilienceactionplan.pdf

a carbon sink so long as the wet soils remain wet, once dried the soil carbon is more vulnerable to consumption by oxygen-loving microbes and emission as gas.

The Bay Area Air District contains Delta wetlands in Alameda, Contra Costa, and Solano counties, and so strategies under the BARCAP have large potential to uplift climate solutions for and using wetlands. This is particularly important, given that Delta wetland soils are some of the carbon-richest in the world[17]. Wetland restoration, alongside wetland creation and wetland enhancement, are strategies to bolster carbon sequestration from wetlands and help meet this goal.

Cultivated Crops, Field Crops, and Vineyards

Regarding agriculture throughout the BARCAP—Region, Napa has the most vineyards and Contra Costa has the most farmland (Table 5). These agricultural lands already require active land management, and are therefore ready targets for the shift to a wide variety of climate-smart agriculture strategies.

The 2022 CARB scoping plan calls for implementation of climate smart practices for annual and perennial crops on ~80,000 acres annually. Some activities that help meet this goal include but are not limited to: Mulching (CPS 484), Residue and Tillage Management - No Till (CPS 329), Cover Cropping (CPS 340), Conservation Crop Rotation (CPS 328), Compost Application (CPS 808), and Nutrient Management (CPS 590).

Grassland/Herbaceous and Shrub/Scrub

Alameda and Contra Costa are closely tied as counties (or partial counties) within the BARCAP—Region with the most land classified as Grassland/Herbaceous, and Napa has the most land classified as Shrub/Scrub (Table 5). These land cover types are grouped together for the purpose of this discussion as they require similar climate-smart land management strategies.

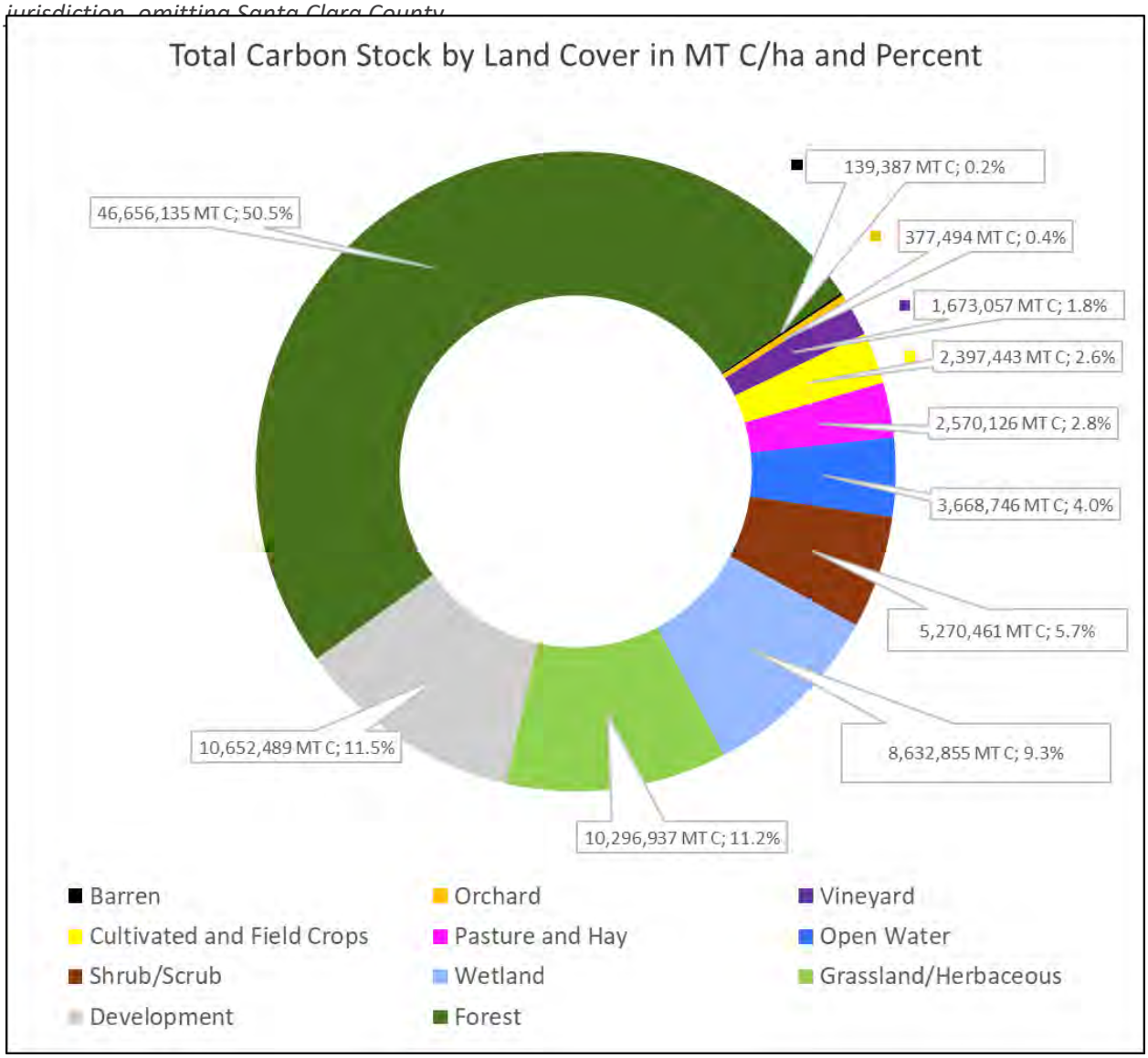
Guidance from the 2022 CARB scoping plan suggests the establishment and expansion of mechanisms that ensure both grasslands and shrublands are protected from land conversion or parcellation. Additionally, CARB recommends the implementation of management strategies that support soil carbon sequestration, biodiversity, and other ecological improvements. In the BARCAP, this could include native grassland restoration or riparian restoration.

BARCAP—Region Carbon Stock

The carbon stocks from each land cover (e.g., Forest, Wetland) and each carbon stock source (e.g., Biomass, Soil) can be summed together to create an overall estimate of Total Carbon Stock throughout the BARCAP—Region. Over an area of 1,113,384 hectares, the ROI for this analysis accounted for 92,335,131 MT carbon. Figure 7, below, illustrates this.

[17] https://deeply.thenewhumanitarian.org/water/community/2017/06/09/californias-delta-poised-to-become-massive-carbon-bank

Figure 7. Carbon Stocks in Bay Area Air District by Land Cover. *The first number in each callout bubble represents Total Carbon Stock in MT C, the second represents the percentage of carbon contained in a given land cover class in the ROI. The land cover classifications reflect the Sonoma County classifications. The data in this figure only includes the area (counties and partial counties) under Bay Area Air District jurisdiction, omitting Santa Clara County.*

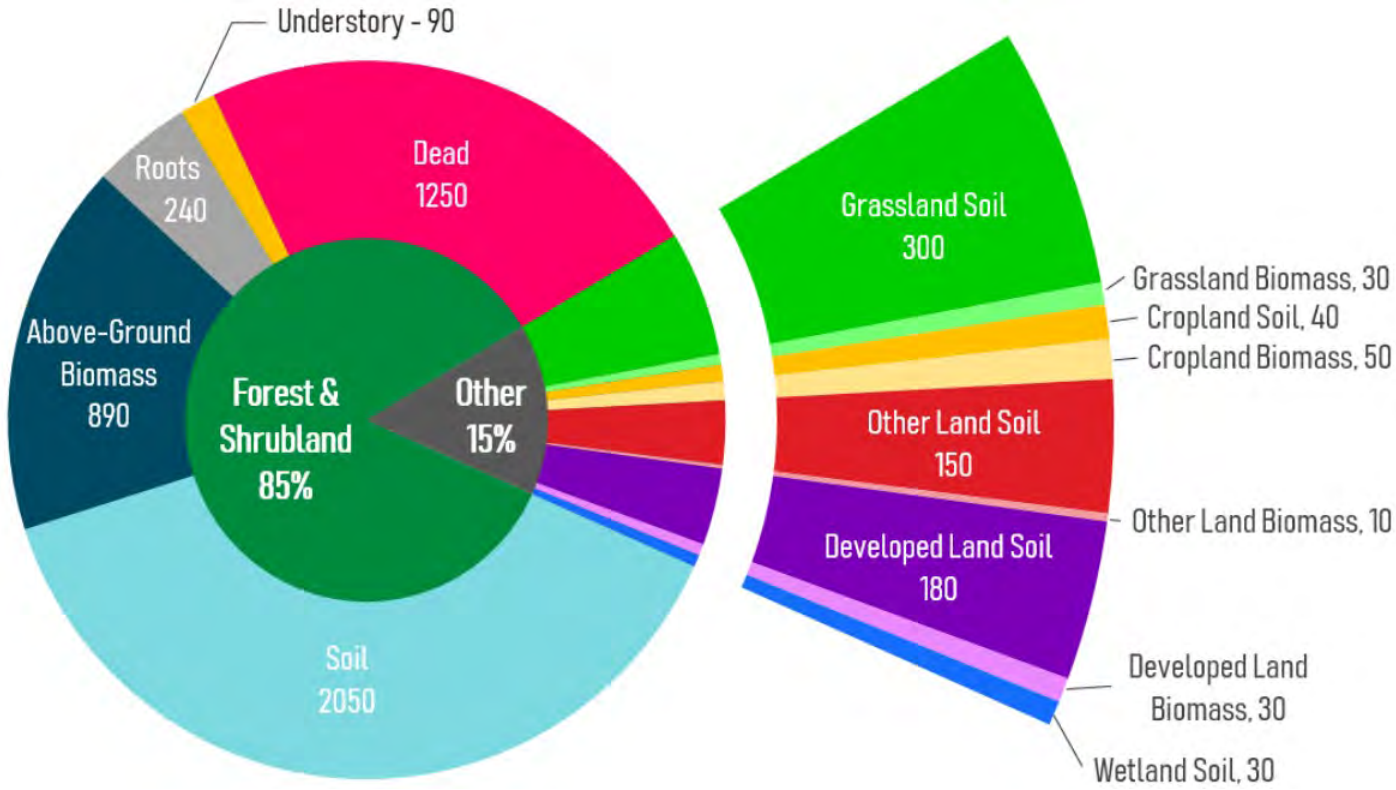


Previously Published Results in the Region

California Air Resources Board Results

According to CARB's 2018 ecosystem carbon inventory[18], built mainly using data from 2014, California's natural and working lands hold approximately 5,340 million metric tons of carbon. The majority of this carbon stock is found in forests and shrublands, which dominate California's landscape and boast the highest carbon density among all land cover types. Despite comprising over 35 percent of California's total acreage, other land categories account for only 15 percent of the carbon stocks. Approximately half of the 5,340 MMT of carbon is stored in soils, while the other half is contained within plant biomass. Figure 8, below, illustrates these findings. Note that Figure 5 uses 2014 distribution of biomass and soil carbon stocks on the California landscape in MMT carbon (rounded to the nearest 10 MMT).

Figure 8. 2014 Carbon Stocks in California NWLs, copied from the 2018 CARB inventory



[18] https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/NWL%20Inventory%20Report%20Website.pdf

Quantitative Comparison with the CARB Inventory

Although the CARB inventory and the Air District inventory disaggregate results using different land cover classifications (CARB using IPCC, Air District using SC classes), enough similarities exist between the two classifications that comparison between the two inventories is possible and appropriate. See Tables 6 and 7, below, for a breakdown of carbon stock by land cover class throughout California (as quantified by CARB) and the Bay Area Air District, respectively.

Both directionally and quantitatively, the two inventories are very similar. The land cover classification Forest and Shrubland from CARB and Forest from the Air District are the most carbon dense per hectare (197 and 175 MT C/ha, respectively). In both inventories, Wetland follows close behind as the next most carbon dense per hectare (142 and 133, respectively). CARB and the Air District inventories agree that Developed Land/Development are low in carbon density (55 and 35 MT C/ha, respectively).

However, CARB and the Air District inventory disagree on the relative density of IPCC Cropland (which corresponds to a combination of Cultivated and Field Crops, Orchard, Pasture and Hay, and Vineyard from the SC classification). CARB estimates Cropland as one of the least carbon dense classifications, only 24 MT C/hectare, whereas the Air District estimates this value in the 41-93 MT C/hectare range. This is likely due to the Air District's relatively high proportion of woody crops (e.g. orchards and vineyards) and higher SOC density as compared to the state as a whole. Given the various forms and densities of biomass that exist throughout the ROI and in each class, this estimation method is limited in its ability to predict biomass carbon stock.

Table 6. Total Carbon Stock per Hectare and Total Carbon Stock (2014), from the 2018 CARB inventory.

CARB Carbon Stock per Hectare and Total Carbon Stock (2014)			
Land Category	**Average Carbon Stock per Hectare (MT C/Hectare)**	**Total Carbon Stock (MT C)**	**Carbon Stock per Hectare Rank**
Other Land	20	160,000,000	6
Cropland	24	90,000,000	5
Developed Land	55	210,000,000	4
Grassland	78	330,000,000	3
Wetland	142	30,000,000	2
Forest and Shrubland	197	4,520,000,000	1
Total	*126*	*5,340,000,000*	*NA*

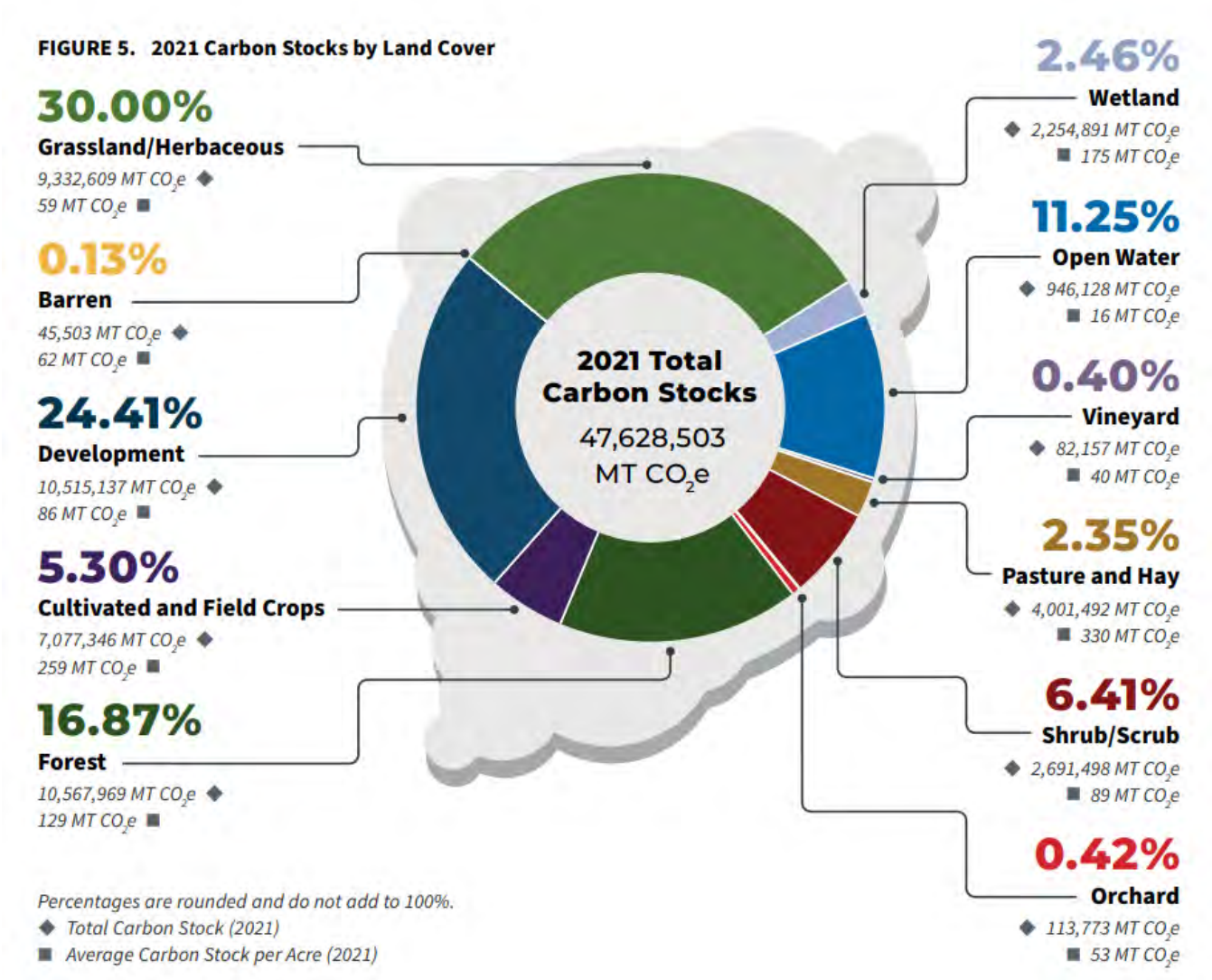
Table 7. BARCAP—Region Carbon Stock per Hectare and Total Carbon Stock (2022), modified from Table 1.

BARCAP—Region Carbon Stock per Hectare and Total Carbon Stock (2022)			
Land Cover Class	**Average Carbon Stock per Hectare (MT C/Hectare)**	**Total Carbon Stock (MT C)**	**Carbon Stock per Hectare Rank**
Development	35	10,652,489	11
Barren	37	139,387	10
Vineyard	41	1,673,057	9
Grassland/Herbaceous	42	10,296,937	8
Shrub/Scrub	68	5,270,461	7
Open Water	74	3,668,746	6
Pasture and Hay	83	2,570,126	5
Orchard	91	377,494	4
Cultivated and Field Crops	93	2,397,443	3
Wetland	133	8,632,855	2
Forest	175	46,656,135	1
Total	*83*	*92,335,131*	*NA*

Contra Costa County Results

The 2023 Contra Costa inventory[19] found total carbon stocks using data from 2021 summing to 47,628,503 MT CO2e. In that inventory, grasslands covered an estimated 30% of land cover, developed land covered an estimated 24% of land cover, and forested land covered an estimated 17% of land cover in the county. Figure 9, below, illustrates these findings.

Figure 9. 2021 Carbon Stocks by Land Cover, copied from the 2023 Contra Costa County inventory



Quantitative Comparison with the Contra Costa County Inventory

Given that the entirety of Contra Costa County falls within the ROI for this analysis, there exists a unique opportunity to validate this analysis against the previously published Contra Costa inventory[20]. The Contra Costa inventory calculated 12,978,222 MT C (originally published as 47,626,503 MT CO2e) in

[19] https://www.contracosta.ca.gov/DocumentCenter/View/79768/Healthy-Lands-Healthy-People-Final-Report
[20] https://www.contracosta.ca.gov/DocumentCenter/View/79768/Healthy-Lands-Healthy-People-Final-Report

2021 over approximately 208,892 hectares (originally published as 516,185 acres). In comparison, for Contra Costa County, this inventory of the Bay Area Air District calculated 14,872,224 MT C over approximately 193,136 hectares (Table 2, above). The difference in hectares between the two inventories is negligible (the percent difference between 208,892 hectares and 193,136 hectares is 7.84%). Furthermore, the difference in MT C between the two inventories is relatively unsurprising (the percent difference between 12,978,222 MT C and 14,872,224 MT C is 13.6%). See Tables 8 and 9, below, for a breakdown of carbon stock by land cover class in Contra Costa and the Bay Area Air District, respectively.

The 13.6% difference in MT C between the two inventories is difficult to explore, as the documentation describing the inventory development process in Contra Costa County is limited, but can likely be partially attributed to differences in data sources. The decision by Contra Costa to employ multiple data sources, instead of manual interpolation from LANDFIRE as in this Air District inventory, may have introduced some slight uncertainty in the resultant estimations of carbon stock. There exists a risk in deriving insights from multiple data sources, because different data sources employ varied quantification methods which may not be readily comparable. For example, one dataset may contain an additional covariate that other datasets do not account for, leading to a higher skew in the regions where that dataset is applicable and resulting in a spike in carbon stock estimation in those regions. Furthermore, the re-classification from the LANDFIRE land cover classifications limits the degree to which these two inventories can be compared using land cover class, especially using the grassland/herbaceous category, which was specifically called out by the Contra Costa inventory as requiring reclassification.

When comparing the order of carbon stock per unit area between Contra Costa County (Table 8) and the Air District (Table 9); agricultural classes (Pasture and Hay, Cultivated and Field Crops) are far more relatively carbon-dense in the Contra Costa County inventory than in the Air District (ranked 1, 2 in CCC; ranked 3, 5 in the Air District). Furthermore, the per acre estimates of these categories and of wetlands are slightly higher than in the Air District inventory (for example, Pasture and Hay average 90 MT C/acre in Contra Costa but only 71 MT C/acre in the Air District). According to the Contra Costa inventory report, this high reported carbon density in those classes is likely because Contra Costa County pasture and hay, cultivated and field crops, and wetlands border the Delta and therefore hold some of the highest soil carbon per acre.

Table 8. Contra Costa County Carbon Stock per Acre and Total Carbon Stock (2021), from the 2023 Contra Costa County inventory.

Contra Costa County Carbon Stock per Acre and Total Carbon Stock (2021)			
Land Cover Class	**Average Carbon Stock per Acre (MT C/Acre)**	**Total Carbon Stock (MT C)**	**Cabon Stock per Acre Rank**
Open Water	4	*257,820*	11
Vineyard	11	*22,388*	10
Orchard	14	*31,003*	9
Grassland/Herbaceous	16	*2,543,136*	8
Barren	17	*11,855*	7
Development	23	*2,865,375*	6
Shrub/Scrub	24	*733,433*	5
Forest	35	*2,879,772*	4
Wetland	48	*614,458*	3
Cultivated and Field Crops	71	*1,928,577*	2
Pasture and Hay	90	*1,090,407*	1
Total	NA	*12,978,222*	*NA*

Table 9. BARCAP—Region Carbon Stock per Acre and Total Carbon Stock (2022), modified from Table 1.

BARCAP—Region Carbon Stock per Acre and Total Carbon Stock (2022)			
Land Cover Class	**Average Carbon Stock per Acre (MT C/Acre)**	**Total Carbon Stock (MT C)**	**Carbon Stock per Acre Rank**
Barren	15	139,387	11
Development	14	10,652,489	10
Vineyard	17	1,673,057	9
Grassland/Herbaceous	17	10,296,937	8
Shrub/Scrub	27	5,270,461	7
Open Water	30	3,668,746	6
Pasture and Hay	34	2,570,126	5
Orchard	37	377,494	4
Cultivated and Field Crops	38	2,397,443	3
Wetland	54	8,632,855	2
Forest	71	46,656,135	1
Total	*34*	*92,335,131*	*NA*

Sonoma County Results

The 2023 Sonoma County inventory[21] analysis using data from 2013 found total carbon stocks summing to 117,593,161 MT CO2e. Using data from 2022, the same inventory found total carbon stocks summing to 105,365,950 MT CO2e. In both years, forest dominates as the land cover class contributing the most to the total carbon stock; about 60%. Figure 10, below, organizes these findings between years in a singular table for ready comparison.

Figure 10. 2013 and 2022 Carbon Stocks by Land Cover, copied from the 2023 Sonoma County inventory.

Land Cover Class	2013 Total Carbon Stock (MT CO_2e)	2022 Total Carbon Stock (MT CO_2e)	Percent Change between 2013 and 2022 (MT CO_2e)
Barren	440,119	367,468	-17
Cultivated and Field Crops	100,577	101,027	0
Development	6,962,559	7,749,627	11
Forest	78,034,944	61,577,998	-21
Grassland/ Herbaceous	18,109,720	17,986,840	-1
Open Water	675,920	1,303,248	93
Orchard	239,362	202,396	-15
Pasture and Hay	2,396,328	3,944,917	65
Shrub/Scrub	4,094,253	5,196,075	27
Vineyard	3,593,475	4,582,317	28
Wetland	2,945,905	2,354,039	-20
Total	117,593,161	105,365,950	-10

Quantitative Comparison with the Sonoma County Inventory

The Sonoma County inventory calculated 28,712,221 MT C (originally published as 105,365,950 MT CO2e) in 2022 over approximately 422,698 hectares (originally published as 1,044,510 acres). In comparison, for Sonoma County, this inventory of the Bay Area Air District calculated 11,981,967 MT

[21] https://sonomacounty.ca.gov/Main%20County%20Site/Administrative%20Support%20%26%20Fiscal%20Services/CAO/Documents/Climate%20Action%20and%20Resiliency/Sonoma-County-Carbon-Inventory-and-Study-with-Executive-Summary.pdf

CO2e over approximately 159,680 hectares (Table 2, above). The difference in both hectares and acreage is unsurprising, given that the entirety of Sonoma County does not fall under the ROI for this analysis, the Air District only includes the southern portion of Sonoma County. See Tables 10 and 11, below, for a breakdown of carbon stock by land cover class in Sonoma County and the Bay Area Air District, respectively.

When comparing the order of carbon stock per unit area between Sonoma County Table 8) and the Air District (Table 7); the order of classes remains relatively directionally consistent (wetland and forest are first or second most carbon dense, vineyard is relatively low when compared to other classes). Moreover, all classes are relatively similar in carbon density between the two inventories; the Sonoma County inventory spans 16-48 MT C/acre and the Air District inventory spans 15-71 MT C/acre. This slight difference can be attributed to the inclusion of additional data sources in the Sonoma County inventory but not in this inventory, as outlined in the Methodology section above.

As in the Contra Costa inventory, the decision by Sonoma County to employ multiple data sources, instead of manual interpolation from LANDFIRE as in this Air District inventory, may have introduced uncertainty in the resultant estimations of carbon stock. Furthermore, the re-classification from the LANDFIRE land cover classifications limits the degree to which these two inventories can be effectively compared using land cover class.

Table 10. Sonoma County Carbon Stock per Acre and Total Carbon Stock (2022), from the 2023 Sonoma County inventory.

Sonoma County Carbon Stock per Acre and Total Carbon Stock (2022)			
Land Cover Class	**Average Carbon Stock per Acre 2022 (MT C/Acre)**	**Total Carbon Stock 2022 (MT C)**	**Carbon Stock per Acre Rank**
Vineyard	16	1,*248*,681	11
Open Water	16	355,135	10
Orchard	18	55,153	9
Development	20	2,111,773	8
Cultivated and Field Crops	22	27,530	7
Grassland/Herbaceous	23	4,901,414	6
Barren	24	100,135	5
Pasture and Hay	26	1,074,990	4
Shrub/Scrub	27	1,415,930	3
Forest	33	16,780,004	2
Wetland	48	641,476	1
Total	*NA*	*28,712,221*	*NA*

Table 9. BARCAP—Region Carbon Stock per Acre and Total Carbon Stock (2022), modified from Table 1. (Reprinted)

BARCAP—Region Carbon Stock per Acre and Total Carbon Stock (2022)			
Land Cover Class	**Average Carbon Stock per Acre (MT C/Acre)**	**Total Carbon Stock (MT C)**	**Carbon Stock per Acre Rank**
Barren	15	139,387	11
Development	14	10,652,489	10
Vineyard	17	1,673,057	9
Grassland/Herbaceous	17	10,296,937	8
Shrub/Scrub	27	5,270,461	7
Open Water	30	3,668,746	6
Pasture and Hay	34	2,570,126	5
Orchard	37	377,494	4
Cultivated and Field Crops	38	2,397,443	3
Wetland	54	8,632,855	2
Forest	71	46,656,135	1
Total	*34*	*92,335,131*	*NA*

Appendix 1: Land Cover Classes Definitions

Land Cover Class	Definition from 2023 Sonoma County Inventory	Definition from 2023 Contra Costa Inventory	Definition from this analysis
Barren	Areas where vegetation accounts for less than 15 percent of total cover, for example areas of bedrock, sand dunes, or gravel pits.	Areas with very little vegetative cover and accumulations of earthen material such as bedrock, beaches, desert, sand dunes, strip mines, gravel pits, and so on.	Areas of bedrock, sand dunes, or gravel pits.
Cultivated and Field Crops	Areas used for the production of vegetables and field crops generally grown for human consumption, such as squash, tomatoes, leafy greens, rye, and oat.	Areas used to produce annual crops, such as corn, tomatoes, or other vegetables.	Areas used to produce vegetables or field crops, including but not limited to wheat, bush fruit, and row crops.
Development	Areas with constructed materials, including buildings and roads	Areas with impervious surfaces and features generally associated with towns or cities including residential, commercial, and industrial uses.	All constructed areas. For this analysis, this includes all EVTs containing the word “Urban” or “Developed”.
Forest	Areas dominated by trees with more than 10 percent tree cover (includes riparian areas that are dominated by trees with more than 10 percent tree cover).	Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover.	Areas dominated by trees, including mixed-vegetation/riparian areas that are generally tree-dominant.
Grassland/Herbaceous	Areas dominated by herbaceous vegetation, with more than 10 percent herb cover, less than 10 percent tree cover and less than 10 percent shrub cover.	Areas dominated by grassy or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management, such as tilling, but can be utilized for livestock grazing.	Areas dominated by herbaceous vegetation, including mixed-vegetation/riparian areas that are generally grass/herbaceous-dominant.
Open Water	Areas of open water such as lakes, reservoirs, rivers, and oceans, generally with less than 25 percent cover of vegetation or soil.	Areas of open water such as lakes, reservoirs, rivers, and oceans, generally with less than 25% cover of vegetation or soil.	EVT of “Open Water”.
Orchard	Areas used to grow perennial woody tree crops such as apples, olives, and stone fruit.	Areas used to grow perennial woody tree crops, such as cherries, almonds, etc.	Areas used to produce fruit or nuts. For this analysis, this is limited to the EVTs of “Western Warm Temperate Orchard” and “Western Cool Temperate Orchard”.
Pasture and Hay	Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture or hay accounts for more than 20 percent of total vegetation.	Areas of grasses and/or legumes planted for livestock grazing, or the production of seed or hay crops, typically perennial plants.	Areas of grasses or areas used to produce seed or hay crops. For this analysis, this is limited to the EVTs of “Western Warm Temperate Pasture and Hayland” and “Western Cool Temperate Pasture and Hayland”.
Shrub/Scrub	Areas dominated by shrubs greater than 10 percent of total shrub cover and less than 10 percent tree cover (includes	Areas dominated by shrubs, less than 5 meters tall, with shrub canopy typically greater than 20% of total vegetation.	Areas dominated by shrubs including mixed-vegetation/riparian areas

Land Cover Class	Definition from 2023 Sonoma County Inventory	Definition from 2023 Contra Costa Inventory	Definition from this analysis
	riparian areas that are dominated by shrubs greater than 10 percent of total shrub cover and less than 10 percent of tree cover.		that are generally shrub-dominant.
Vineyard	Areas planted with grapevines, generally used for producing grapes used in winemaking.	Areas used to grow perennial woody vine crops such as grapes.	Areas used to produce wine. For this analysis, this is limited to the EVTs of "Western Warm Temperate Vineyard" and "Western Cool Temperate Vineyard".
Wetland	Areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the perennial herbaceous vegetation indicate soil or substrate periodically saturated with or covered with water.	Areas where the soil or substrate is periodically saturated or covered with water.	Areas dominated by wetland with periodically saturated soil or substrate.

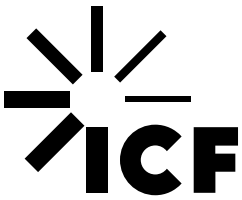
Appendix 2: Comparison of LANDFIRE, Sonoma County, & IPCC Land Cover Classes

LANDFIRE Existing Vegetation Type (EVT)	Sonoma County	IPCC
California Central Valley and Southern Coastal Grassland	Grassland/Herbaceous	Grassland
California Central Valley Mixed Oak Savanna	Forest	Forest land
California Central Valley Riparian Shrubland	Wetland	Forest land
California Central Valley Riparian Woodland	Wetland	Forest land
California Coastal Closed-Cone Conifer Forest and Woodland	Forest	Forest land
California Coastal Live Oak Woodland and Savanna	Forest	Forest land
California Coastal Redwood Forest	Forest	Forest land
California Lower Montane Blue Oak-Foothill Pine Woodland and Savanna	Forest	Forest land
California Lower Montane Blue Oak Woodland and Savanna	Forest	Forest land
California Lower Montane Foothill Pine Woodland and Savanna	Forest	Forest land
California Maritime Chaparral	Shrub/Scrub	Forest land
California Mesic Chaparral	Shrub/Scrub	Forest land
California Mesic Serpentine Grassland	Grassland/Herbaceous	Grassland
California Northern Coastal Grassland	Grassland/Herbaceous	Grassland
California Ruderal Grassland and Meadow	Grassland/Herbaceous	Grassland
California Ruderal Scrub	Shrub/Scrub	Forest land
California Xeric Serpentine Chaparral	Shrub/Scrub	Forest land
Californian Ruderal Forest	Forest	Forest land
Central and Southern California Mixed Evergreen Woodland	Forest	Forest land
Central California Coast Ranges Cliff and Canyon	Barren	Other land
Developed-High Intensity	Development	Settlements
Developed-Low Intensity	Development	Settlements
Developed-Medium Intensity	Development	Settlements
Developed-Roads	Development	Settlements
Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland	Forest	Forest land
Mediterranean California Foothill and Lower Montane Riparian Shrubland	Wetland	Forest land
Mediterranean California Foothill and Lower Montane Riparian Woodland	Wetland	Forest land
Mediterranean California Lower Montane Black Oak-Conifer Forest and Woodland	Forest	Forest land
Mediterranean California Lower Montane Black Oak Forest and Woodland	Forest	Forest land
Mediterranean California Lower Montane Conifer Forest and Woodland	Forest	Forest land
Mediterranean California Mesic Serpentine Chaparral	Shrub/Scrub	Forest land
Mediterranean California Mesic Serpentine Woodland	Forest	Forest land
Mediterranean California Mixed Evergreen Forest	Forest	Forest land
Mediterranean California Mixed Oak Woodland	Forest	Forest land
Mediterranean California Northern Coastal Dune	Barren	Other land
Mediterranean California Serpentine Foothill and Lower Montane Riparian Shrubland and Seep	Wetland	Wetland
Mediterranean California Serpentine Foothill and Lower Montane Riparian Woodland and Seep	Wetland	Wetland
Northern and Central California Dry-Mesic Chaparral	Shrub/Scrub	Forest land
Northern California Coastal Scrub	Shrub/Scrub	Forest land
Open Water	Open Water	Water
Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	Barren	Other land
Southern California Coastal Scrub	Shrub/Scrub	Forest land
Temperate Pacific Freshwater Emergent Marsh	Wetland	Wetland
Temperate Pacific Subalpine-Montane Wet Meadow	Wetland	Wetland
Temperate Pacific Tidal Salt and Brackish Marsh	Wetland	Wetland
Western Cool Temperate Bush fruit and berries	Cultivated and Field Crops	Cropland
Western Cool Temperate Close Grown Crop	Cultivated and Field Crops	Cropland

LANDFIRE Existing Vegetation Type (EVT)	Sonoma County	IPCC
Western Cool Temperate Developed Deciduous Forest	Development	Settlements
Western Cool Temperate Developed Evergreen Forest	Development	Settlements
Western Cool Temperate Developed Herbaceous	Development	Settlements
Western Cool Temperate Developed Mixed Forest	Development	Settlements
Western Cool Temperate Developed Shrubland	Development	Settlements
Western Cool Temperate Fallow/Idle Cropland	Cultivated and Field Crops	Cropland
Western Cool Temperate Orchard	Orchard	Cropland
Western Cool Temperate Pasture and Hayland	Pasture and Hay	Cropland
Western Cool Temperate Row Crop	Cultivated and Field Crops	Cropland
Western Cool Temperate Row Crop - Close Grown Crop	Cultivated and Field Crops	Cropland
Western Cool Temperate Urban Deciduous Forest	Development	Settlements
Western Cool Temperate Urban Evergreen Forest	Development	Settlements
Western Cool Temperate Urban Herbaceous	Development	Settlements
Western Cool Temperate Urban Mixed Forest	Development	Settlements
Western Cool Temperate Urban Shrubland	Development	Settlements
Western Cool Temperate Vineyard	Vineyard	Cropland
Western Cool Temperate Wheat	Cultivated and Field Crops	Cropland
Western North American Ruderal Wet Meadow & Marsh	Wetland	Wetland
Western North American Ruderal Wet Shrubland	Wetland	Wetland
Western Warm Temperate Bush fruit and berries	Cultivated and Field Crops	Cropland
Western Warm Temperate Close Grown Crop	Cultivated and Field Crops	Cropland
Western Warm Temperate Developed Deciduous Forest	Development	Cropland
Western Warm Temperate Developed Evergreen Forest	Development	Cropland
Western Warm Temperate Developed Herbaceous	Development	Cropland
Western Warm Temperate Developed Mixed Forest	Development	Cropland
Western Warm Temperate Developed Shrubland	Development	Cropland
Western Warm Temperate Fallow/Idle Cropland	Cultivated and Field Crops	Cropland
Western Warm Temperate Orchard	Orchard	Cropland
Western Warm Temperate Pasture and Hayland	Pasture and Hay	Cropland
Western Warm Temperate Row Crop	Cultivated and Field Crops	Cropland
Western Warm Temperate Row Crop - Close Grown Crop	Cultivated and Field Crops	Cropland
Western Warm Temperate Urban Deciduous Forest	Development	Settlements
Western Warm Temperate Urban Evergreen Forest	Development	Settlements
Western Warm Temperate Urban Herbaceous	Development	Settlements
Western Warm Temperate Urban Mixed Forest	Development	Settlements
Western Warm Temperate Urban Shrubland	Development	Settlements
Western Warm Temperate Vineyard	Vineyard	Cropland
Western Warm Temperate Wheat	Cultivated and Field Crops	Cropland
Klamath-Siskiyou Lower Montane Serpentine Mixed Conifer Woodland	Forest	Forest land
California Montane Jeffrey Pine-(Ponderosa Pine) Woodland	Forest	Forest land
Klamath-Siskiyou Xeromorphic Serpentine Chaparral	Shrub/Scrub	Forest land
Klamath-Siskiyou Xeromorphic Serpentine Savanna	Grassland/Herbaceous	Forest land
Mediterranean California Mesic Mixed Conifer Forest and Woodland	Forest	Forest land
North Pacific Oak Woodland	Forest	Forest land
Klamath-Siskiyou Cliff and Outcrop	Barren	Other land
Mediterranean California Subalpine Meadow	Grassland/Herbaceous	Grassland
California Montane Woodland and Chaparral	Shrub/Scrub	Forest land
Mediterranean California Red Fir Forest	Forest	Forest land
Klamath-Siskiyou Upper Montane Serpentine Mixed Conifer Woodland	Forest	Forest land
Northern California Mesic Subalpine Woodland	Forest	Forest land
Mediterranean California Subalpine Woodland	Forest	Forest land
Mediterranean California Alpine Bedrock and Scree	Barren	Other land
North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest	Forest	Forest land
Inter-Mountain Basins Cliff and Canyon	Barren	Other land
Columbia Plateau Western Juniper Woodland and Savanna	Grassland/Herbaceous	Forest land

LANDFIRE Existing Vegetation Type (EVT)	Sonoma County	IPCC
Interior Western North American Temperate Ruderal Grassland	Grassland/Herbaceous	Cropland
Columbia Plateau Steppe and Grassland	Grassland/Herbaceous	Grassland
North Pacific Montane Riparian Woodland	Wetland	Forest land
North American Arid West Emergent Marsh	Wetland	Wetland
North Pacific Lowland Riparian Shrubland	Wetland	Forest land
Interior Western North American Temperate Ruderal Shrubland	Shrub/Scrub	Forest land
North Pacific Lowland Riparian Forest	Wetland	Forest land
Columbia Plateau Low Sagebrush Steppe	Shrub/Scrub	Forest land
Inter-Mountain Basins Big Sagebrush Shrubland	Shrub/Scrub	Forest land
North Pacific Montane Riparian Shrubland	Wetland	Forest land
Great Basin & Intermountain Introduced Annual Grassland	Grassland/Herbaceous	Grassland
Great Basin & Intermountain Ruderal Shrubland	Shrub/Scrub	Forest land
Inter-Mountain Basins Big Sagebrush Steppe	Shrub/Scrub	Forest land
Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	Forest	Forest land
Sierra Nevada Cliff and Canyon	Barren	Other land
Rocky Mountain Aspen Forest and Woodland	Forest	Forest land
Sierran-Intermontane Desert Western White Pine-White Fir Woodland	Forest	Forest land
Inter-Mountain Basins Montane Sagebrush Steppe	Shrub/Scrub	Forest land
Sierra Nevada Subalpine Lodgepole Pine Forest and Woodland	Forest	Forest land
North Pacific Active Volcanic Rock and Cinder Land	Barren	Other land
North Pacific Wooded Volcanic Flowage	Barren	Forest land
North Pacific Montane Shrubland	Shrub/Scrub	Forest land
North Pacific Montane Massive Bedrock-Cliff and Talus	Barren	Other land
North American Glacier and Ice Field	Barren	Other land
Mediterranean California Alpine Dry Tundra	Grassland/Herbaceous	Grassland
North Pacific Alpine and Subalpine Dry Grassland	Grassland/Herbaceous	Grassland
Great Basin Pinyon-Juniper Woodland	Forest	Forest land
Great Basin Foothill and Lower Montane Riparian Shrubland	Wetland	Forest land
Columbia Plateau Silver Sagebrush Seasonally Flooded Shrub-Steppe	Shrub/Scrub	Forest land
Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	Forest	Forest land
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	Forest	Forest land
Great Basin Foothill and Lower Montane Riparian Woodland	Wetland	Forest land
Great Basin & Intermountain Introduced Annual and Biennial Forbland	Grassland/Herbaceous	Grassland
Inter-Mountain Basins Semi-Desert Shrub-Steppe	Shrub/Scrub	Forest land
Inter-Mountain Basins Playa	Barren	Other land
Inter-Mountain Basins Wash	Barren	Other land
Inter-Mountain Basins Alkaline Closed Depression	Barren	Wetland
Inter-Mountain Basins Greasewood Flat	Shrub/Scrub	Wetland
Inter-Mountain Basins Mixed Salt Desert Scrub	Shrub/Scrub	Forest land
Great Basin & Intermountain Introduced Perennial Grassland and Forbland	Grassland/Herbaceous	Grassland
Great Basin Xeric Mixed Sagebrush Shrubland	Shrub/Scrub	Forest land
Rocky Mountain Subalpine-Montane Mesic Meadow	Grassland/Herbaceous	Grassland
Columbia Plateau Scabland Shrubland	Shrub/Scrub	Forest land
Rocky Mountain Alpine-Montane Wet Meadow	Grassland/Herbaceous	Wetland
Inter-Mountain Basins Semi-Desert Grassland	Grassland/Herbaceous	Grassland
Columbia Plateau Ash and Tuff Badland	Barren	Other land
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland	Shrub/Scrub	Forest land
Southern Rocky Mountain Montane-Subalpine Grassland	Grassland/Herbaceous	Grassland
Rocky Mountain Subalpine-Montane Riparian Shrubland	Wetland	Forest land
Great Basin Foothill and Lower Montane Riparian Herbaceous	Wetland	Grassland
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	Forest	Forest land
Rocky Mountain Subalpine-Montane Riparian Woodland	Wetland	Forest land
Rocky Mountain Lower Montane-Foothill Shrubland	Shrub/Scrub	Forest land
Great Basin Semi-Desert Chaparral	Shrub/Scrub	Forest land
Sierra Nevada Alpine Dwarf-Shrubland	Shrub/Scrub	Forest land

LANDFIRE Existing Vegetation Type (EVT)	Sonoma County	IPCC
Interior West Ruderal Riparian Forest	Wetland	Wetland
Interior West Ruderal Riparian Scrub	Wetland	Wetland
Rocky Mountain Cliff Canyon and Massive Bedrock	Barren	Other land
Mojave Mid-Elevation Mixed Desert Scrub	Shrub/Scrub	Forest land
Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	Forest	Forest land
Rocky Mountain Alpine Turf	Grassland/Herbaceous	Grassland
Mediterranean California Alpine Fell-Field	Grassland/Herbaceous	Forest land
Sonora-Mojave Mixed Salt Desert Scrub	Shrub/Scrub	Forest land
Sonora-Mojave Creosotebush-White Bursage Desert Scrub	Shrub/Scrub	Forest land
Inter-Mountain Basins Active and Stabilized Dune	Barren	Other land
North American Warm Desert Pavement	Barren	Other land
North American Warm Desert Bedrock Cliff and Outcrop	Barren	Other land
North American Warm Desert Badland	Barren	Other land
North American Warm Desert Ruderal & Planted Scrub	Shrub/Scrub	Forest land
North American Warm Desert Ruderal & Planted Grassland	Grassland/Herbaceous	Grassland
North American Warm Desert Volcanic Rockland	Barren	Other land
North American Warm Desert Active and Stabilized Dune	Barren	Other land
North American Warm Desert Playa	Barren	Other land
Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	Forest	Forest land
Sonora-Mojave Semi-Desert Chaparral	Shrub/Scrub	Forest land
North American Warm Desert Lower Montane Riparian Shrubland	Wetland	Forest land
North American Warm Desert Lower Montane Riparian Woodland	Wetland	Forest land
North American Warm Desert Riparian Shrubland	Wetland	Forest land
North American Warm Desert Wash Shrubland	Wetland	Forest land
North American Warm Desert Riparian Woodland	Wetland	Forest land
North American Warm Desert Wash Woodland	Wetland	Forest land
North American Warm Desert Cienega	Wetland	Wetland
North American Warm Desert Riparian Mesquite Bosque Shrubland	Wetland	Forest land
North American Warm Desert Riparian Herbaceous	Wetland	Wetland
North American Warm Desert Riparian Mesquite Bosque Woodland	Wetland	Forest land
Southern California Dry-Mesic Chaparral	Shrub/Scrub	Forest land
Southern California Oak Woodland and Savanna	Forest	Forest land
Southern California Coast Ranges Cliff and Canyon	Barren	Other land
Mediterranean California Southern Coastal Dune	Barren	Other land
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	Shrub/Scrub	Forest land
Southern Rocky Mountain Ponderosa Pine Woodland	Forest	Forest land
Baja Semi-Desert Coastal Succulent Scrub	Shrub/Scrub	Forest land
Sonoran Granite Outcrop Desert Scrub	Shrub/Scrub	Forest land
Sonoran Paloverde-Mixed Cacti Desert Scrub	Shrub/Scrub	Forest land
Agriculture-Cultivated Crops and Irrigated Agriculture	Cultivated and Field Crops	Cropland
Western Warm Temperate Aquaculture	Open Water	Cropland
Developed-Open Space	Development	Settlements



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Appendix C

Technical Methodology for Quantifying GHGs, Co-pollutants, and Costs

March 2026

Bay Area Regional Climate Action Plan



Measure Quantification Technical Reference Appendix to the Bay Area Regional Climate Action Plan

November 24, 2025

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Executive Summary

As part of the development of the 2025 Bay Area Regional Climate Action Plan (BARCAP), the Air District engaged ICF Incorporated, LLC (ICF) to conduct technical analyses to support the planning process. This report presents the methodologies, assumptions, and results of the analysis conducted to evaluate the greenhouse gas (GHG), co-pollutants, and cost impacts of the BARCAP measures.

The baseline for calculating estimated emission reductions from BARCAP measures is the Air District's future projections of the GHG inventory. The future projections estimate GHG emissions through 2050 and are based on the California 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan) Reference Scenario, with adjustments made to reflect emission changes expected from implementation of the Air District's Rules 9-4 and 9-6.[1] The state's Advanced Clean Cars II (ACCII) regulation and the Metropolitan Transportation Commission/Association of Bay Area Governments (MTC/ABAG) Plan Bay Area 2050+ are accounted for separately from the quantification of measures in the transportation sector. The 2022 Scoping Plan Reference Case includes SB100 power sector targets through 2030. Additionally, an estimate of GHG sequestration and emissions were developed for the natural and working lands (NWL) sector.

The Air District's future projections reflect reductions in GHG emissions based on a variety of factors, including expected decreases in certain activities, expected increases in technological efficiencies, and already-in-effect state and Air District policies, regulations, and programs. Across all sectors, the future projections of the BARCAP GHG Emissions Inventory show a 35% reduction in GHG emissions from 2022 to 2045.[2] Total gross GHG emissions were 54.1 million metric tons of carbon dioxide equivalent (MMTCO2e) in 2022. The largest emitting sector is transportation, followed by industry, buildings, and power. Agriculture and waste each contribute less than 5% to the GHG inventory. See Appendix A of the BARCAP for a full overview of the BARCAP GHG Inventory and Projections.

Ten measures were assessed across the buildings, transportation, waste, power, and NWL sectors. With implementation of these measures, GHG emissions decrease 40% from 2022 to 2045, with the transportation sector measures driving the largest GHG reductions. Cumulatively, they lead to an additional reduction in GHG emissions by approximately 50 $MMTCO_2e$ from 2025 through 2045. The measures focus on feasible, actionable, and widely supported strategies, many of which also complement work at the state level or remove barriers and scale projects at the local level. While they contribute significantly towards the GHG reduction targets for 2030 and 2045, they do not achieve them by themselves. Rather, the BARCAP measures are designed to help achieve the targets by working in concert with state and local actions, many of which are enabled by BARCAP measures. Table 1 shows the cumulative GHG reductions by measure.

Table 1. Cumulative GHG Reductions by Measure, 2025 - 2045

Measure	$MMTCO_2e$
B1	1.52
B2	0.09
B3	NE

T1	4.99
T2	6.84
T3	9.87
T4	NE
W1	(0.14)
W2	NE
W3	NE
P1	3.28
P2	NE
NWL1	NE
NWL2	12.22
NWL3	0.12
NWL4	11.29
Total	**50.07**

Note: NE – Not Estimated. Measures B3, T4, W2, W3, P2, and NWL1 were not estimated since they are primarily supporting measures.

In some cases, measures included in the BARCAP address GHG emissions that were not included in the GHG inventory for future emission projections. For example, measure P-1 in Table 1 includes the emission reductions associated with the installation of behind-the-meter (BTM) solar. These emission reductions result from replacing grid electricity, some of which could be generated outside of the BARCAP region, with electricity generated by solar panels on site. However, the BARCAP inventory and future projections only include GHG emissions that are generated within the region.

Further, the BARCAP region is part of the interconnected CAISO electricity system, which includes electricity that is both imported into and exported out of the region. As a result, changes in electricity supply and demand within the BARCAP region – such as increased BTM solar generation or demand from electric vehicle (EV) charging – may not directly reduce natural gas-powered electricity generation within the region. Natural gas power plants in the BARCAP region may also serve broader CAISO demand and may export electricity outside the region. Conversely, power plants located outside the region can provide electricity that is consumed within the region. Therefore, to estimate avoided GHG emissions from power plants, GHG emission reductions for measure P-1 are evaluated based on the overall consumption of electricity occurring within the region, regardless of where the electricity was generated.

Both the upfront cost of implementing measures in this plan, and any savings achieved due to decreased energy costs, were modeled and presented in terms of net present value (NPV). NPV is calculated in real dollars (2025$) using a 3% discount rate. The estimated costs to implement measures range from over $22 million for Measure B2 to over $1.4 billion for Measure T1. Implementation costs are included in GHG and Cost Quantification Methodology descriptions for each measure in this report.

Costs are estimated from a societal framing and generally include capital costs, such as upfront equipment costs, and operating costs and savings, such as impacts on fuel and electricity bills, related to measure activities. Program administration and related costs incurred during implementation of the measures are not explicitly quantified in the societal framing approach. For measure W-1 because there are no operational or capital costs the societal framing was not appropriate, and therefore program administration and related programmatic costs were used to estimate the cost to implement. Cost estimates do not consider the value of other benefits, including reduction in criteria air pollutants, improvements in public health, water quality, quality of life, and other difficult to quantify factors. Also, perhaps most importantly, the estimates do not assign dollar values for carbon removed.

Two measures, P-1 and T-2, show a net cost savings from 2025 – 2045. The net cost savings are due to initial upfront costs of implementation being offset over the longer term by savings. For example, measure P-1 shows a net cost savings of approximately $16 billion from 2025 – 2045. The overall cost savings are derived from estimated electricity bill savings resulting from on-site generation of electricity and current and projected electricity rates in the region. More details on the costs and savings associated with P-1 are shown in Table 40.

In addition to GHG emissions, emissions of criteria air pollutants and their precursors (CAPs) and toxic air contaminants (TACs) from sources covered by measures may harm public health and the environment. Like the GHG inventory, tracking these co-pollutants (CAPs and TACs) in an inventory over time provides an understanding of what pollutants are being released, how much, and their key sources.

In addition to reducing GHG emissions, the proposed measures simultaneously reduce emissions of certain co-pollutants. Cumulative reductions of co-pollutant emissions from 2025 through 2045 across the BARCAP region include: 246,000 MT of carbon monoxide (CO), 11,000 MT (metric tons) of nitrogen oxides (NO_x), 630 MT of particulate matter 10 (PM_{10}), and 120 MT of sulfur dioxide (SO_2), as shown in Table 51. The majority of these emission reductions result from reduced tailpipe emissions in the transportation sector due to increased zero-emission vehicle adoption. However, these vehicles still contribute to PM emissions through road dust and tire wear/brake wear emissions throughout the BARCAP region.

GHG and Cost Quantification Methodology, Assumptions, and Results

B-1: Support implementation of the Air District's zero NO_x building appliances rules by addressing key challenges

Measure description: Support an equitable and affordable transition to healthy, zero NO_x water and space heating for buildings in the region by addressing key implementation challenges of the Air District's appliance rules, which go into effect for small gas residential water heaters in 2027 and gas furnaces in 2029. Actions are informed by the Air District's Implementation Working Group in addition to BARCAP stakeholder engagement.

Methodology for Estimating GHG Reductions

GHG emission reductions from Measure B-1 were quantified by assessing the extent to which targeted education and outreach programs can accelerate the adoption of zero NO_x appliances relative to the future projections of the GHG inventory. Changes in scope 2 emissions associated with the increases in electricity use from the implementation of this measure were excluded from this analysis.

First, the existing stock of residential gas water heaters and furnaces in the BARCAP region was estimated using data from NREL's ResStock dataset and the BayREN Existing Buildings Dashboard (Table 2). The building stock was segmented to develop separate stock turnover models for residential space heating systems, small residential water heating systems, and large residential water heating systems. Average equipment lifetimes outlined in Table 3 were applied to model the cumulative stock and annual turnover rates from 2025 through 2050. For consistency, key inputs to this model were validated and aligned with assumptions from previous reports published by the Air District.

To establish the baseline scenario, data sources from Table 2 and Table 3 were used to forecast baseline adoption of heat pump technologies prior to the compliance dates included in the Air District's zero NO_x rules. Beginning in 2027 for small gas water heaters, 2029 for gas furnaces, and 2031 for large water heating systems, heat pump technologies were assumed to replace all gas systems reaching the end of their useful life, in accordance with the Air District's zero NO_x appliance rules. Adoption curves and emission trajectories were then calibrated to align with forecasted residential natural gas combustion from the Air District's projections.

Emission reductions from Measure B-1 were evaluated along two pathways, depending on whether interventions occur before or after the Air District's zero NO_x appliance rules compliance dates.

- Prior to the start of the zero NO_x rules compliance dates, customers retain the option to replace systems with like-for-like gas equipment. In this context, emission reductions from Measure B-1 are achieved by incentivizing the early replacement of NO_x-emitting equipment with zero NO_x heat pump systems. By accelerating the transition to zero NO_x options ahead of equipment burnout, pre-rule replacements avoid emissions that would otherwise have occurred from the continued operation of gas appliances over their remaining lifetime.
- After the zero NO_x rules compliance dates, the baseline assumes that natural gas furnaces and water heaters are replaced with heat pumps at the end of their useful life. Under Measure B-1, targeted outreach and education are expected to accelerate retirements of natural gas appliances with an average estimated remaining useful life of five years. The targeted outreach and education interventions were assumed to result in the early replacement of roughly 5 percent of the eligible equipment stock each year.

Stock turnover models were used to estimate annual energy consumption by fuel type and technology. Emission impacts were calculated from avoided natural gas combustion and refrigerant leakage. All heat pumps installed after 2025 were assumed to use low-GWP refrigerants R-32 or R-454B in line with US EPA's Hydrofluorocarbon (HFC) Technology

Transitions rule under the American Innovation and Manufacturing (AIM) Act.[3] For HVAC heat pumps, no incremental leakage was assumed for homes already equipped with central AC systems.

Assumptions

- The average effective useful life (EUL) of a residential gas furnace was assumed to be 18 years, and the EUL of a gas water heater was assumed to be 13 years, consistent with Air District assumptions.
- The remaining useful life (RUL) of equipment replaced early is assumed to be five years, based on averages and industry standard practice reported in Connecticut's Measure Life Study (see Tables 2 and 3 below).
- Outreach and education efforts under Measure B-1 are assumed to drive the early replacement of five percent of each eligible equipment cohort per year.
- All heat pump systems installed after 2025 are assumed to use low-GWP refrigerants R-32 or R-454B, in line with the Technology Transitions regulations covered under the EPA's AIM Act. Regulations covered under the AIM Act require that, beginning in 2025, HVAC equipment must be manufactured using refrigerant having a GWP of no more than 700.
- For HVAC heat pumps, no incremental refrigerant leakage is assumed for households that already have central air conditioning systems. These households represent approximately 42% of the baseline housing stock, based on BayREN's Existing Buildings Study (See Table 2). Values of refrigerant charge, annual leakage rate, end-of-life leakage rate and refrigerant global warming potential (GWP), all come from California's High Global Warming Potential Gases Emission Inventory (See Table 2). Leakage rate assumptions are shown in Table 3.

Limitations

- Modeled energy savings represent averages and may not fully capture variability across building types, vintages, and occupant behaviors. Uncertainty is greater for multifamily buildings due to diverse system types and shared loads. Energy savings and costs for large heat pump water heaters are especially uncertain given the limited availability of performance and cost data.
- The assumption that outreach and education efforts under Measure B-1 will drive the early replacement of five percent of each eligible equipment cohort per year is not grounded in comparable studies or prior programs, as this type of intervention has not been widely tested at scale or in the context of a zero NO_x appliance standard.
- Upfront cost estimates for heat pumps are drawn from the TECH Clean California cost dataset[4], as reported in the Air District's report on Installation Costs for Zero NO_x Space and Water Heating Appliances, as well as data from Community Choice Aggregators (CCAs), Publicly Owned Utilities (POUs) and municipal incentive programs (see Table 6). While these estimates include the cost of panel upgrades, they may understate future costs if early adopters were more likely to live in homes with sufficient electrical capacity and thus faced lower upgrade expenses. In the TECH Clean dataset, only 4% of single-family homes undergoing space heating upgrades reported panel upgrade costs. By comparison, a 2024 UCLA study found that 32% of single-family homes in California have electrical panels of intermediate capacity (100 amps) and would likely require load management or panel optimization.[5]

Data Sources

Table 2. Data Sources for Measure B-1 GHG Quantification

Data Source	Application
NREL's ResStock Dataset 2024.2	Bay Area housing stock characteristics, including share of single-family and multifamily units, fuel mix for space heating and water heating, and average energy consumption from gas space heating and water heating appliances
NREL's ResStock Dataset 2024.1 Measure Packages	Average change in gas and electricity consumption resulting from heat pump replacements
BayREN Existing Buildings Dashboard	Number of single-family and multifamily units
Air District's GHG Inventory Projections	Baseline emission projections for residential natural gas
Air District Draft Environmental Impact Report for the Proposed Amendments to Building Appliance Rules	EUL for gas furnaces and water heaters
Connecticut Measure Life Study	Average RUL at early replacement
California's High Global Warming Potential Gases Emission Inventory	Refrigerant charge size, leakage rate, refrigerant type, and refrigerant global warming potential
BayREN Existing Buildings Study Building Characteristics Report	Share of homes with existing central AC systems
EPA's HFC Technology Transitions Regulations	Information on GWP requirements for new HVAC systems installed starting in 2025.
California's High Global Warming Potential Gases Emission Inventory	Values of refrigerant charge, annual leakage rate, end-of-life leakage rate, refrigerant type, and refrigerant GWP

Table 3. Key Modeling Assumptions for Measure B1

Key Assumptions	Value
Baseline Gas Furnace Lifetime	18 years
Baseline Gas Water Heater Lifetime	13 years
RUL at Early Replacement	5 years
Share of Homes with Existing AC	54%
HP HVAC Refrigerant Operational Leakage Rate	5.3%
HP Water Heater Refrigerant Operational Leakage Rate	1.0%
HP HVAC Refrigerant End-of-life Leakage Rate	80%
HP Water Heater Refrigerant End-of-life Leakage Rate	100%

GHG Quantification Results

Table 4. Annual Reduction in Scope I GHG Emissions from Measure B-1 ($MMTCO_2e$)

Source	2025	2030	2035	2040	2045
Avoided Natural Gas Combustion	.0126	.0757	.1123	.0735	.0581
Refrigerant Leakage	(.0003)	(.0017)	(.0024)	(.0059)	(.0083)
Net Emissions	.0124	.0741	.1099	.0675	.0498

Table 5. Annual Reduction in Energy Consumption from Measure B-1

Source	2025	2030	2035	2040	2045
Natural Gas (MMBTU)	238,657	1,431,944	2,122,201	1,389,427	1,098,528
Electricity (MWh)	(15,444)	(92,666)	(142,542)	(106,664)	(87,968)

Measure Cost Approach

Two types of customer costs were evaluated: upfront installation costs and long-term impacts on utility bills. Costs related to program administration or ongoing equipment maintenance were not included. Incentives were also excluded due to uncertainty regarding the availability, value, and duration of federal, state, and local funding sources. All estimates are presented in 2025 real dollars, with additional results for early replacements expressed in net present value (NPV) using a 3% real discount rate.

Upfront costs for NO_x-emitting appliances, zero NO_x appliances, and AC systems were sourced from the Air District's Implementation Working Group (IWG) 2024 Report on Installation Costs for Zero-NO_x Space and Water Heating Appliances. These estimates (shown in columns 1-3 of Table 6) were initially developed using cost data from the TECH Clean California dataset [6] and include installation, appliance, and labor expenses, as well as electrical panel upsizing where applicable (defined as an increase in capacity of at least 50 amps). These appliance cost estimates provide the starting point for the two early replacement cost calculations described below.

Table 6. Upfront Cost Inputs for Early Replacements

Appliance and Housing Type		Appliance Costs			Early Replacement Costs	
		1. NO_x Emitting	*2. Central AC[1]*	*3. Zero-NO_x*	*A. Pre-Rule Incremental Cost[2]*	*B. Post-Rule Timing Cost (NPV)[3]*
Space Heater[2]	Single Family	$10,731	$3,437	$19,640	$8,909	$2,774
Space Heater[2]	Multifamily	$10,731	$3,437	$20,676	$9,945	$2,921
Water Heater	Single Family	$5,231	$3,437	$7,071	$1,840	$999
Water Heater (Small)	Multifamily	$5,231	$0	$8,309	$3,078	$1,174
Water Heater (Large)[4]	Multifamily	$5,231	$0	$10,289	$4,020	$1,454

[1] *Incremental costs for space heating systems incorporate a weighted average cost for AC systems, reflecting the assumption that AC costs ($8,106 per unit) will be avoided in 42% of homes with existing central AC.*
[2] *Zero NO_x space heating costs were calculated as the average of ducted and non-ducted systems.*
[3] *Zero NO_x water heating costs were calculated as the average of tanked and tankless systems.*
[4] *Additional data from BAMBE program staff were used to refine cost estimates for large water heaters.*

The method for estimating upfront costs from early replacements differs depending on whether installations occurred before or after the zero NO_x rules take effect.

A) **Pre-rule period**: Before the compliance dates, households can still replace equipment with a like-for-like gas system. In this period, the upfront cost impact reflects the additional amount a household would pay to choose a zero NO_x appliance instead of a new NO_x emitting appliance. This comparison is made by subtracting the cost of the NO_x emitting appliance (columns 1-2 of Table 6) from the cost of the zero NO_x appliance (column 3 of Table 6). The resulting pre-rule incremental cost is in column A of Table 6. For space heating appliances, this comparison also accounts for avoided AC costs. 42% of homes have existing central AC and therefore avoid the $8,106 cost of purchasing a new AC system. To reflect this, a weighted average AC cost is applied (column 2 of Table 6).

B) **Post-rule period**: After the compliance dates, all replacement systems were assumed to be zero NO_x appliances. In this period, the calculations rely on a net present value framework (NPV), where the cost impact reflects the cost of replacing equipment earlier than necessary, rather than the cost of choosing one technology over another. Instead of comparing heat pumps to gas systems, the analysis compares the cost of purchasing a heat pump early versus the cost of purchasing the same heat pump five years later. These post-rule timing costs (column B of Table 6) capture only the time value of money. They are calculated by discounting the cost of the zero NO_x appliance (column 3 of Table 6) five years into the future using a 3% annual discount rate. These upfront costs appear only in the NPV results in Table 9. When expressed in real 2025 dollars, the timing cost is $0, so they do not appear in Table 8. An example of this calculation is described in Box 1.

Bill impacts were estimated based on projected changes in natural gas and electricity consumption and corresponding utility rate forecasts. For this analysis, it was assumed that early adopters of zero NO_x appliances were more likely to be higher income households that do not qualify for CARE given the high upfront costs of zero NO_x appliances. Accordingly, baseline electricity and natural gas rates were drawn from the most recent available residential rate schedules for PG&E non-CARE customers.

The CARE program provides income-qualified households in California with a 30-35% discount on electricity bills and a 20% discount on natural gas bills. Because CARE customers receive a larger discount on electricity, their bill increases from electrification are projected to be significantly lower than those of non-CARE customers.

Future rates through 2045 were projected using historical trends in PG&E prices. A key limitation of this analysis is that the relative cost effectiveness of electrification is highly sensitive to utility rate trajectories, which are subject to considerable uncertainty due to market conditions, regulatory policies, and infrastructure investment needs. In this analysis, electricity rates are assumed to increase faster than natural gas rates based on historical trends, resulting in high

long-term operating costs for electrified homes and larger bill impacts over time. Additional details on cost assumptions and data sources are provided below.

Cost Assumptions

- Upfront costs include installation, appliance, and labor expenses, as well as electrical panel upsizing where applicable.
- In homes with existing central AC, incremental costs for heat pump HVAC systems reflect the avoided cost of replacing air conditioning equipment.
- Baseline electricity prices were based on the average regional non-CARE residential rate under PG&E's base plan in June 2024.
- Baseline natural gas prices were based on PG&E's non-CARE residential rate from February 2025.
- Electricity prices were assumed to escalate at 6.18% annually and natural gas delivery charges were assumed to escalate at 5.3% annually. Escalation rates were derived from E3's analysis of historical PG&E trends and converted to nominal values, assuming a 2% annual inflation rate.
- Net present value was calculated using a 3% real discount rate. These costs are shown in Table 8.

Box 1. Example HPWH Upfront Costs from the Pre-Rule and Post-Rule Periods

To help illustrate the estimated cost calculations for measure B-1, the pre-rule period and post-rule period scenarios are described in plain language in the examples below. Cost modeling used the two concepts of Incremental Costs and Timing Costs both pre and post rule scaled to the full implementation of the measure to enumerate costs.

A) Pre-Rule Period: Incremental Costs

It's 2026, and Maria's gas water heater is getting old. Wanting to be proactive and avoid the hassle of a surprise breakdown, she decides to replace it early. At this point, the zero NO_x rules have not yet gone into effect for small water heaters, so purchases of new gas systems are still allowed. When Maria shops around, she receives two quotes:

- A new gas water heater: $5,231
- A new heat pump water heater (HPWH): $7,071

The HPWH costs more upfront, so the incremental cost is the difference between the two: $1,840. Maria decides to move ahead with the HPWH and takes advantage of available rebates (not included in calculation).

B) Post-Rule Period: Timing Costs (NPV)

It's 2030, and the zero NO_x rules have now taken effect. Maria's neighbor, David, also has an older gas water heater. After seeing Maria successfully switch to a HPWH, David starts thinking about replacing his own unit. His water heater hasn't had any major issue and likely has about five years of life left. Because the rules are now in effect, any replacement David buys must be a zero NO_x system (assumed to be a HPWH). David faces two choices:

- Buy a HPWH now ($7,071) to replace his water heater early
- Buy a HPWH five years later when his water heater actually breaks down

If David replaces it early, he ends up buying the HPWH five years sooner than he otherwise would. Although he is buying the same appliance in both scenarios, buying it earlier introduces a new kind of cost: the cost of moving the purchase forward in time. Under the NPV framework, money spent in the future is worth less than money spent today, due to the time value of money. David could have used that money for something else in the meantime, like earning interest or paying down debt. To reflect this "opportunity cost," the future cost of the heat pump is discounted using a 3% annual discount rate: $\$7,071 \times (0.97^5) \approx \$6,070$.

This means that by waiting five years the new hot water heater would "cost" David about $6,070 in today's dollars. By replacing the water heater early requires him to spend the full $7,071 today. The difference ($1,001) is the timing cost of replacing the appliance early.

It is important to note that the early replacement of NO_x-emitting appliances generates the additive GHG emission reductions that are attributed to measure B-1.

Box 2. Key Differences in Key Data Inputs and Assumptions: Implementation Working Group report and BARCAP Analysis

A detailed analysis on Installation Costs for Zero-NO_x Space and Water Heating Appliances and associated bill impacts was conducted as part of the Air District's Implementation Working Group (IWG) process. While many of the same input assumptions were used across both efforts, several key findings from the IWG report are not reflected here due to differences in assumptions and scope. In particular, the IWG's findings show that many households — especially low and moderate income (LMI) households — can benefit from large rebates and bill savings, particularly if they qualify for discounted utility rates through CARE. By contrast, this analysis focuses on the subset of customers most likely to pursue voluntary early replacement. These customers are assumed to be higher-income households given the high upfront costs typically involved. As a result, households modeled in this analysis do not receive CARE discounts or rebates, which leads to higher upfront and operating costs than those shown in the IWG analysis. Other key differences are summarized below:

IWG Cost Assessment	Measure B-1 Cost Assessment
Finds that incentives can average $3,400–$13,900 per household, with the largest rebates going to LMI customers.	Rebates are excluded due to uncertainty surrounding long-term funding and the assumed income profile of customers, leading to higher upfront costs.
Evaluates bill impacts under both CARE and non-CARE rates and finds that most CARE customers see net bill savings.	Assumes all customers use non-CARE rates, resulting in high bill increases after electrification.
Segments customers by electricity usage and shows that high-usage households and those who switch to E-ELEC rates typically experience bill savings from electrification.	Does not account for usage-tier and rate-plan switching. Applies a single average electricity rate (simplified approach), which contributes to higher bill increases.
Assesses bill impacts using current or near-term utility rates.	Projects bill impacts over a longer time horizon using utility rates that increase over time. Under these assumptions, electricity rates are expected to rise more quickly than natural gas rates, resulting in substantially higher bill increases

Cost Data Sources

Table 7. Data Sources for Measure B-1 Cost Quantification

Data Source	Application
Air District Report on Installation Costs for Zero-NO_x Space and Water Heating Appliances (2024)	Installation costs for NO_x-emitting and zero NO_x HVAC and water heating appliances
E3 Report on Benefit-Cost Analysis of Targeted Electrification and Gas Decommissioning in California (2023)	Escalation rate for gas and electricity, derived from historical PG&E data
CPUC California Electric Rate Comparison	Residential electricity rates by county (PG&E Base Plan)
PG&E Rate Schedule for Natural Gas	Residential natural gas rates
US Bureau of Labor Statistics Consumer Price Index	Inflation adjustments (CPI)

Results

Cumulative costs incurred from 2025-2045 are shown in the tables below. As explained in Box 2, these results rely on a simplified set of assumptions and do not capture all cost components modeled in the IWG report.

Table 8 presents cumulative costs in real 2025 dollars. The upfront costs shown here include only pre-rule replacements (see example A in Box 1). These early replacements phase out after 2030, as the final stage of the zero NO_x rules takes effect for large HPWHs in 2031. Most of the net costs in Table 8 come from higher utility bills, driven by the higher price of electricity relative to natural gas. As described in Box 2, these bill impacts are based on a rate simplified analysis and do not account for several features of rate structures that can reduce bills for some customers.

Table 9 presents cumulative costs in NPV terms. Upfront costs are higher in Table 9 because they also include post-rule timing costs (see example B in Box 1). In contrast, bill impacts are lower in NPV terms because bill increases occur over a long period, and costs that occur further in the future are discounted, making them worth less in today's dollars.

Table 8. Measure B-1 Cumulative Costs from 2025-2045 (Million Real 2025 Dollars)

Category	Net Cost
Upfront Costs	$270
Bill Impacts	$558
Net Costs	**$828**

Table 9. Measure B-1 Cumulative Costs from 2025-2045, Net Present Value (Million Real 2025 Dollars)

Category	Net Cost
Upfront Costs	$518
Bill Impacts	$372
Net Costs	**$890**

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 disadvantaged communities.

Measure description: Perform holistic building retrofits that include energy efficiency, electrification, and home repair and remediation by braiding together and augmenting funding, services, and other assistance from existing programs. Focus retrofits in the BARCAP region's low-income and frontline communities. This measure builds on the Air District's Bay Area Healthy Homes Initiative program, and the initial buildings-focused program concept first articulated in the CPRG Priority Climate Action Plan (called the "Bay Area Clean Homes Initiative," or "BACHI"). The implementation of this measure is highly dependent on seeking and obtaining other funding sources to implement (per B-2.1). BayREN and the Air District are committed to leading this exploration in partnership with other key organizations as noted below.

Methodology for Estimating GHG Reductions

To estimate GHG emission reductions from Measure B-2, a whole-home retrofit program concept that integrates and augments funding, services, and technical assistance from existing state, federal, and local programs was developed. The approach builds on BayREN's EASE and BAMBE programs and assumes that additional resources will be leveraged from California's Equitable Building Decarbonization Direct Install program, Energy Savings Assistance, TECH Clean California rebates, Golden State rebates, USDA's Home Repair program, HEERA, HOMES Pay for Performance, and incentives from utilities and community choice aggregators. As with B-1 changes in scope 2 emissions associated with the increases in electricity use from the implementation of this measure were excluded from this analysis.

Table 10 summarizes measures included in the whole-home retrofit. All participating homes were assumed to electrify both HVAC and water heating systems, and to complete air sealing and insulation upgrades. Cooking electrification, smart thermostat, and lighting upgrades were assumed to occur in a subset of homes, based on baseline saturation levels reported in BayREN's Existing Buildings Study, ResStock, and the California Public Utility Commission's Impact Evaluation of Smart Thermostats.

Table 10. Measure B-2 Whole-Home Retrofit Measures

Measure	Base Case	Upgrade Case
Heat Pump HVAC	Gas furnace	Heat pump HVAC
Heat Pump Water Heater	Gas water heater	Heat pump water heater
Cooking Range Electrification	Gas range	50/50 mix of electric resistance and induction ranges
Lighting	100% fluorescent lighting (compact fluorescent lamps)	100% LED lighting (general service filament-LED lamps)
Smart Thermostat	Manual thermostat	Smart thermostat

Measure	Base Case	Upgrade Case
Air Sealing & Insulation	Base insulation	Attic floor insulation (R-49) and air leakage reduction (30% whole-home reduction in AC

ResStock and BayREN's Existing Buildings Study were used to characterize baseline energy use for single-family and multifamily homes and to estimate achievable savings from retrofit measures. To account for the Air District's zero NO_x appliance standards, energy savings and emission reductions were calculated separately for space heating, water heating, and other measures included in the whole-home retrofit. For HVAC and water heating electrification, calculations followed the methodology used in Measure B-1. Prior to the standards taking effect, savings were credited to early adoption of heat pumps, which displaced the full remaining lifetime of gas appliances. After the standards take effect, gas replacements are no longer permitted in the baseline scenario. In this period post rule compliance dates, savings were credited only for early retirements, assumed to occur when equipment had about five years of remaining useful life.

Because both B1 and B2 offer some of the same opportunities for emissions reductions through the early retirement of NO_x-emitting appliances, there is the possibility for overlap in how these reductions are being counted. However, in the context of the Bay Area's housing stock (over 2.7 million households), the modeled annual installations under B-1 (~14,000) and B-2 (~900) represent a small fraction of the total equipment stock, so instances of double counting are assumed to be relatively small.

For each measure completed through the whole-home retrofit, annual energy savings, avoided emissions from reduced natural gas consumption, and emissions from refrigerant leakage associated with the installation of new heat pumps were estimated. All heat pumps installed after 2025 were assumed to use low-GWP refrigerants in compliance with AIM Act regulations. No incremental refrigerant leakage was assumed for HVAC heat pumps installed in homes already equipped with central air conditioning.

Assumptions

- The modeled program was assumed to operate from 2026 through 2030, serving approximately 900 homes each year, based on input provided by the Air District. Of these, 75% were assumed to be single-family homes and 25% in multifamily homes.
- All participating homes were assumed to electrify both HVAC and water heating systems, and to complete air sealing and insulation upgrades. Cooking electrification, smart thermostat, and lighting upgrades were assumed to occur in a subset of homes, based on baseline saturation levels reported in BayREN's Existing Buildings Study, ResStock, and the California Public Utility Commission's Impact Evaluation of Smart Thermostats
- The average EUL of a residential gas furnace is assumed to be 18 years, while the EUL of a gas water heater is assumed to be 13 years, consistent with Air District assumptions.
- The RUL of equipment replaced early is assumed to be five years, based on values and industry standard practice reported in Connecticut's Measure Life Study.

- All heat pump systems installed after 2025 were assumed to use low-GWP refrigerants R-32 and R-454B to comply with the HFC Technology Transitions rule covered under the AIM Act.
- No incremental refrigerant leakage from HVAC heat pumps was assumed for homes already equipped with central air conditioning. These homes represent approximately 42% of the baseline housing stock according to BayREN's Existing Buildings Study.
- The target audience for this program is assumed to be moderate-income residents. No participants were assumed to receive discounted utility rates through the CARE program.

Limitations

- The feasibility of this program is highly dependent on the availability of state, federal, and local incentives, as well as other funding sources. Achieving the modeled participation levels will also require local staff time and resources. Both the value and duration of these funding sources remain uncertain.
- Modeled energy savings represent averages and may not capture the full variability across building types, vintages, and occupant behaviors. Savings from weatherization measures, in particular, can vary widely depending on the baseline condition of the home. Multifamily buildings also present additional uncertainty given the diversity of system types and shared loads.
- Upfront cost estimates for heat pumps include average panel upgrade costs from the TECH Clean dataset, as reported in the Air District's Installation Costs for Zero NO_x Space and Water Heating Appliances report. However, these estimates may understate future costs if early adopters were more likely to live in homes with sufficient electrical capacity and thus faced lower upgrade expenses. As electrification expands, a larger proportion of households will likely require panel upgrades.

Data Sources

Table 11. Data Sources for Measure B-2 GHG Quantification

Data Source	Application
NREL's ResStock Dataset 2024.2	Bay area housing stock characteristics, including share of SF/MF units and energy consumption from space heating and water heating appliances
Air District Draft Environmental Impact Report for the Proposed Amendments to Building Appliance Rules	EUL for gas furnaces and water heaters
California TRM, Massachusetts TRM	EUL for cooking equipment, lighting, thermostats, and insulation
Connecticut Measure Life Study	Average RUL at early replacement
California's High Global Warming Potential Gases Emission Inventory	Values of refrigerant charge, annual leakage rate, end-of-life leakage rate, and refrigerant GWP
BayREN Existing Buildings Study Building Characteristics Report	Share of homes with existing AC systems

Data Source	Application
CPUC Impact Evaluation of Smart Thermostats - Residential Sector - Program Year 2019	Share of homes with existing smart thermostats

GHG Quantification Results

Table 12. Annual Reduction in Scope I GHG Emissions from Measure B-2 ($MMTCO_2e$)

Source	2025	2030	2035	2040	2045
Avoided Natural Gas Combustion	-	.0089	.0041	.0033	.0011
Refrigerant Leakage	-	(.0002)	(.0001)	(.0005)	(.0005)
Net Emissions	-	.0086	.0040	.0028	.0005

Table 13. Annual Reduction in Energy Consumption from Measure B-2

Source	2025	2030	2035	2040	2045
Natural Gas (MMBTU)	-	166,711	76,346	62,778	19,775
Electricity (MWh)	-	(7,380)	(1,604)	(904)	342

Measure Cost Approach

The range of costs that building owners and occupants may incur when participating in a whole-home retrofit were evaluated. Costs were estimated in 2025 real dollars, and a 3 percent real discount rate was applied to calculate net present value. The analysis considered two primary components: upfront costs and bill impacts. Costs associated with program administration and ongoing equipment maintenance were not included.

Upfront costs encompass installation, appliance, and labor expenses, as well as panel upsizing costs where applicable. Incentives were excluded from the analysis due to uncertainty regarding the availability, value, and duration of federal, state, and local funding sources. For HVAC and water heating measures, incremental upfront costs were defined differently depending on whether installations occurred before or after the zero NO_x rules took effect:

- In the period prior to rule compliance dates, incremental cost was defined as the additional expense of installing a heat pump relative to the cost of replacing the unit with a like-for-like gas system at burnout.
- In the period post rule compliance dates, incremental cost was defined as the present-value difference between purchasing a heat pump early and purchasing the heat pump five years later, when the equipment reaches the end of its useful life. This approach captures the opportunity cost of spending money earlier and accounts for the consumer discount rate.

Bill impacts were estimated based on changes in natural gas use and electricity consumption. No participants were assumed to receive discounted utility rates through the CARE program, as the target audience for this program is moderate-income households. Baseline utility rates for electricity and natural gas were drawn from PG&E residential rate schedules. Electricity rates

were assumed to escalate at 6.18 percent annually, while natural gas delivery rates were assumed to escalate at 5.3 percent annually.

Cost Assumptions

- Upfront costs include installation, appliance, and labor expenses, as well as panel upsizing costs where required.
- In homes with existing central AC, incremental costs for heat pump HVACs include the cost of avoided AC systems.
- Baseline electricity prices were based on the average regional non-CARE residential rate under PG&E's base plan in June 2024.
- Baseline natural gas prices were based on PG&E's non-CARE residential rate from February 2025.
- Electricity prices were assumed to escalate at 6.18% annually, and natural gas delivery charges are assumed to escalate at 5.3% annually, based on E3's analysis of historical PG&E rates.
- Net present value was calculated using a 3% real discount rate.

Cost Data Sources

Table 14. Cost Data Sources for Measure B-2 Cost Quantification

Data Source	Application
Air District Report on Installation Costs for Zero-NO_x Space and Water Heating Appliances (2024)	Upfront costs for HVAC and water heating appliances
NREL Residential Measures Database	Upfront costs for smart thermostats
RMI Green Upgrade Calculator	Upfront costs for cooking appliances
EIA Technology Forecast Updates Residential and Commercial buildings Appendix C (2023)	Upfront costs for lighting
Bay Area Residential Decarbonization Industry and Workforce Overview (2024)	Upfront costs for insulation and air sealing
E3 Report on Benefit-Cost Analysis of Targeted Electrification and Gas Decommissioning in California (2023)	Escalation rate for gas and electricity, derived from historical PG&E data
CPUC California Electric Rate Comparison	Residential electricity rates by county (PG&E Base Plan)
PG&E Rate Schedule for Natural Gas	Residential natural gas rates
US Bureau of Labor Statistics Consumer Price Index	Inflation adjustments (CPI)

Results

Table 15. Measure B-2 Cumulative Costs from 2025-2045 (Million Real 2025 Dollars)

Category	Net Cost
Upfront Costs	$ 51
Bill Impacts	$ (29)

Category	Net Cost
Net Costs	**$ 22**

Table 16. Measure B-2 Cumulative Costs from 2025-2045, Net Present Value (Million Real 2025 Dollars)

Category	Net Cost
Upfront Costs	$ 55
Bill Impacts	$ (20)
Net Costs	**$ 35**

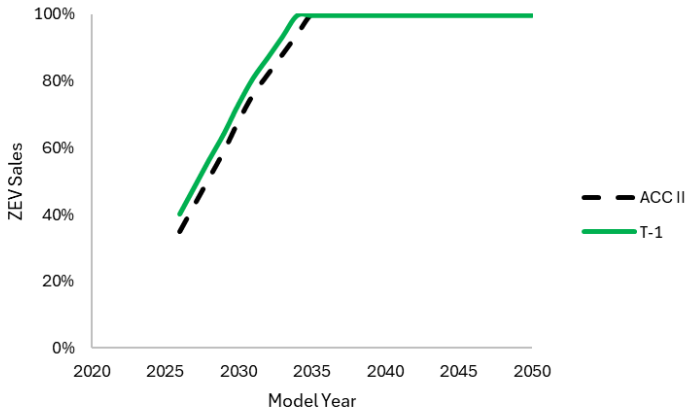
T-1: Accelerate Light-Duty EV Adoption

Measure description: Support the acceleration of light-duty electric vehicle (EV) adoptions through expanded incentives for EVs, coordinated planning for EV charging locations and installation of EV chargers to meet expected demand across the BARCAP region, and expanded support for low-income residents, frontline communities, and local governments in adopting EVs.

Methodology for Estimating GHG Reductions

California's ACC II regulation, which mandates a phased transition to zero-emission vehicles (ZEVs) with the goal of achieving 100% ZEV sales for new light-duty vehicles by 2035, is the state's approach for electrifying the light-duty vehicle market. Emission reductions from this regulation are not included in the quantification of this measure. Additionally, emission reductions that would result from the implementation of vehicle miles traveled (VMT) reducing strategies in MTC/ABAG's Plan Bay Area 2050+ are not included in the quantification of this measure. This measure evaluates the impact of accelerating the transition beyond the ACC II baseline by assuming a 6% increase in light-duty ZEV sales relative to the trajectory established by ACC II. This enhanced adoption scenario results in achieving 100% light-duty ZEV sales by model year 2034—one year earlier than the ACC II target (see Figure 1). Consistent with other measures, changes in scope 2 emissions associated with the increases in electricity use from the implementation on this measure were excluded from this analysis.

Figure 3. LDV ZEV Sales by Year



To quantify the emissions impact of this accelerated pathway, the EMFAC2021 model was used to update the electric VMT fraction for each model year. This allowed for a more precise projection of the reduction in internal combustion engine (ICE) VMT, which directly correlates to decreased fuel consumption and associated greenhouse gas (GHG) emissions. EMFAC2021 model was used to update electric VMT (eVMT) fraction for each model year and project the percentage reduction in ICE VMT and therefore, the fuel consumption and associated GHG emissions. The resulting percentage

reduction was then applied to the light-duty vehicle emissions in the inventory to estimate the emissions after T-1 adoption.

Limitations

- The effectiveness of accelerated EV adoption depends heavily on timely and widespread deployment of charging infrastructure. Delays or gaps in infrastructure could limit actual EV usage and reduce expected emissions benefits.
- GHG emissions reduction estimates do not account for the emissions increase resulting from additional electricity consumption and only focus on direct tailpipe GHG emissions reductions from vehicles.

Data Sources

Table 17. Data Sources for Measure T-1 GHG Quantification

Data Source	Application
EMFAC2021 Model	BARCAP region Light-duty Vehicles Miles Traveled and Energy Consumption for Years 2025 - 2050
Advanced Clean Cars II	Projecting 6% Increased Light-duty EV Sales Compared to ACC II

Assumptions

- ZEVs exist in the vehicle fleet for the same length of time as ICEVs.
- ZEV activity/use is identical to an ICEV.
- The plug-in hybrid vehicles (PHEV) sales were assumed to grow as high as 22% following the recommended percentage[7].
- In model year 2026, a 50/50 split between blended and non-blended PHEVs is assumed. This distribution gradually shifts toward full adoption of non-blended PHEVs, reaching 100% non-blended PHEV penetration by model year 2036.
- The eVMT fraction of PHEV—representing the proportion of total miles traveled using electric power—is projected to improve over time due. For passenger cars, the eVMT fraction of PHEV increases from 60% in 2026 to 79% by 2036. For light-duty trucks, the fraction rises from 54% in 2026 to 74% in 2036.

GHG Quantification Results

Table 18. Annual Reduction in Scope I GHG Emissions from Measure T-1 ($MMTCO_2e$)

Source	2025	2030	2035	2040	2045
GHG Emissions Reduction from Fuel Combustion	-	0.14	0.27	0.35	0.40

Measure Cost Approach

- Capital costs associated with light-duty vehicle electrification were estimated by multiplying the projected number of new vehicle purchases in each model year by the average purchase price per vehicle. These costs were differentiated by vehicle class (e.g., passenger car, SUV, pickup) and engine type (e.g., internal combustion engine, battery electric vehicle, plug-in hybrid). The average cost per vehicle reflects the additional upfront cost of electric vehicles compared to conventional vehicles, accounting for technology improvements and cost declines over time.

- Electric vehicle supply equipment (EVSE) costs were estimated assuming one level 2 charger per plug-in electric vehicle.
- All capital costs were assumed to occur at the time of vehicle sale, consistent with adoption curves and equipment lifetime assumptions.
- Fuel costs were calculated by multiplying the projected annual fuel consumption for each fuel type (e.g., gasoline, diesel) by the corresponding projected cost per unit of fuel, derived from EIA's Annual Energy Outlook 2025. Electricity prices were calculated using unit prices from PG&E residential time-of-use service for plug-in electric vehicles.
- Vehicle sales and energy consumption are derived from EMFAC 2021.
- Vehicle maintenance costs were estimated by multiplying the VMT for each vehicle and engine type by an average maintenance cost per mile ($/mi). These per-mile costs were specific to each powertrain type and reflect differences in maintenance needs between electric and conventional vehicles, such as reduced brake wear and fewer moving parts in electric drivetrains. These per-mile costs were derived from Argonne National Laboratory's AFLEET[8] tool.
- Reported cost estimates represent the net change in total costs between the zero-emission adoption scenario and the reference case scenario.

Cost Data Sources

Table 19. Cost Data Sources for Measure T-1 Cost Quantification

Metric	Data Sources
Vehicle capital costs	ICF's projection of vehicle capital cost by type and fuel using AFLEET (Alternative Fuel Life-Cycle Environmental and Economic Transportation)
Projected fuel prices	EIA's Annual Energy Outlook 2025, Table 3
Electricity prices	PG&E residential time-of-use service for plug-in electric vehicles
Vehicle maintenance cost	AFLEET (Alternative Fuel Life-Cycle Environmental and Economic Transportation)

Results

Table 20. Measure T-1 Cumulative Costs 2025-2045 (Million Real 2025 dollars)

Category	Net Costs
Vehicle Cost	$2,871
EVSE Cost	$1,612
Fuel Cost	$(1,395)
Maintenance Cost	$(1,619)
Net Costs	**$1,468**

Key Takeaway

On average, approximately 278,000 light-duty vehicles are sold each year in the BARCAP region. Applying the 6% increase target means that the district would need to incentivize about 16,700 new ZEVs annually. If the district provided an incentive of $2,500 per vehicle, the annual cost would be about $40 million. Over a 25-year period, this amounts to approximately $1 billion in spending to achieve the reductions envisioned under the T1 measure by 2050. To put this in perspective, the Clean Cars for All program in the Bay Area has replaced roughly 5,000 vehicles

over about 10 years (through June 30, 2025). By comparison, the T-1 measure would require replacing more than three times that number, 16,700 vehicles, in just a single year. This underscores the significant scale-up in program funding and implementation capacity that would be required to meet the T-1 goals.

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

Measure description: Accelerate zero-emission medium- and heavy-duty vehicles and equipment adoption through expanded incentives, coordinated deployment of EV chargers and fueling infrastructure to meet expected demand across the BARCAP region, while incorporating the needs of low-income and frontline communities.

Methodology for Estimating GHG Reductions

To quantify emissions reductions from accelerated ZEV adoption in medium- and heavy-duty (MHD) vehicle sector, a scenario-based approach was developed using the EMFAC2021 model. This approach was built upon the baseline assumptions embedded in EMFAC2021. Specifically, a 5% increase in annual electric truck sales for each model year was forecasted, compared to projected sales per that year, and following the same adoption trend. This adjustment was used to estimate the resulting increase in the electric VMT fraction across the MHD fleet and associated reduction in GHG emissions and fuel consumption. Consistent with other measures, changes in scope 2 emissions associated with the increases in electricity use from the implementation on this measure were excluded from this analysis.

Assumptions

- ZEVs exist in the vehicle fleet for the same length of time as ICEVs.
- ZEV activity/use is identical to an ICEV.

Limitations

- As with LDV electrification limitations, ZEV adoption coincides with EV charger adoption and accessibility. If electric vehicle purchases are incentivized but ZEV charging and fueling infrastructure is not enhanced, actual ZEV adoption may be lower than projected. The opposite is also true – if ZEV charging and fueling infrastructure is made more widespread but ZEV purchases are not incentivized, actual ZEV adoption may be lower than projected.
- GHG emissions reduction estimates do not account for the emissions increase resulting from additional electricity consumption and only focus on direct tailpipe GHG emissions reductions from vehicles.

Data Sources

Table 21. Data Sources for Measure T-2 GHG Quantification

Data Source	Application
EMFAC2021 Model	Bay Area AQMD's Medium- and Heavy-duty Vehicles Miles Traveled and Energy Consumption for Years 2025 – 2045

GHG Quantification Results

Table 22. Annual Reduction in Scope I GHG Emissions from Measure T-2 ($MMTCO_2e$)

Source	2025	2030	2035	2040	2045
GHG Emissions Reduction from Fuel Combustion	-	0.10	0.29	0.54	0.73

Measure Cost Approach

- Capital costs associated with MHDV electrification were estimated by multiplying the projected number of new vehicle purchases in each model year by the average purchase price per vehicle. These costs were differentiated by vehicle class (e.g., Single Unit Long-haul Truck) and engine type (e.g., internal combustion engine, battery electric vehicle). The average cost per vehicle reflects the additional upfront cost of electric vehicles compared to conventional vehicles, accounting for technology improvements and cost declines over time.
- Electric vehicle supply equipment (EVSE) cost was estimated assuming one 50 kW charger per electric vehicle in Class 2b-3 and Class 4-8 Vocational. One 150 kW charger was assumed for Class 7-8 Tractor.
- Fuel costs were calculated by multiplying the projected annual fuel consumption for each fuel type (e.g., gasoline, diesel) by the corresponding projected cost per unit of fuel, derived from EIA's Annual Energy Outlook 2025. Electricity prices were calculated using unit prices from PG&E business electric vehicles schedule.
- Fuel consumption is based on EMFAC 2021.
- Vehicle maintenance costs were estimated by multiplying the VMT for each vehicle and engine type by an average maintenance cost per mile ($/mi). These per-mile costs were specific to each powertrain type and reflect differences in maintenance needs between electric and conventional vehicles, such as reduced brake wear and fewer moving parts in electric drivetrains. These per-mile costs were derived from Argonne National Laboratory's AFLEET tool.
- Reported cost estimates represent the net change in total costs between the zero-emission adoption scenario and the reference case scenario.

Cost Data Sources

Table 23. Cost Data Sources for Measure T-2 Cost Quantification

Metric	Data Sources
Vehicle capital costs	ICF's projection of vehicle capital cost by type and fuel using AFLEET (Alternative Fuel Life-Cycle Environmental and Economic Transportation)
Projected fuel prices	EIA's Annual Energy Outlook 2025, Table 3
Electricity prices	PG&E business electric vehicles schedule
Vehicle maintenance cost	AFLEET (Alternative Fuel Life-Cycle Environmental and Economic Transportation)

Results

Table 24. Measure T-2 Cumulative Costs 2025-2045 (Million Real 2025 dollars)

Category	Net Costs
Vehicle Cost	$387
EVSE Cost	$688
Fuel Cost	$(1,186)
Maintenance Cost	$(133)
Net Costs	**$(244)**

T-3: Accelerate Decarbonization of Goods Movement

Measure description: Pilot and implement policies that accelerate decarbonization of goods movement and deliveries of goods and reduce emissions that result from increased e-commerce.

Methodology for Estimating GHG Reductions

This measure consists of two key components aimed at reducing GHG emissions from medium- and heavy-duty vehicles and off-road equipment:

Electrifying Last-Mile Deliveries: To quantify the potential impact of electrifying last-mile delivery operations, the trip data from the National Renewable Energy Laboratory's (NREL) FleetDNA database were analyzed. The analysis revealed that 34% of total VMT made by medium- and heavy-duty vehicles (classes 3-8) are generated by trips under an average of ten miles in length. Assuming electrifying all these trips and accounting for the potential interaction with T-2, this measure is estimated to reduce fuel consumption of medium- and heavy-duty vehicles by 28% in 2050.

Warehouse Indirect Source Rule: This measure is targeting emissions from associated truck and equipment activity in large warehouses. Since measure T-2 is already accounting for increased electrification of MDH trucks, this measure focuses on transport refrigeration activity, with a 50% electrification of transport refrigeration units (TRUs) assumed by 2050. The Offroad Emissions Inventory database was used to estimate diesel consumption and adjust the existing sales to reflect 50% electrification by 2050.

These two electrification scenarios and their associated reductions in ICE VMT were used to project changes in GHG emissions from MHDV, as well as TRUs.

Assumptions

- All short-distance delivery trips are electrified by 2050. Annual rate of electrification adoption is assumed to follow the same trend as MHD ZEV sales (increasing until 2035 and uniform after 2035 until 2050).
- 50% of TRUs are electrified by 2050. Annual rate of electrification adoption is assumed to be an increasing linear trend from 5% eTRU sale in 2026 to 50% eTRU sale in 2050.

Limitations

- Electrification depends on timely and widespread deployment of charging infrastructure.

- FleetDNA data may not fully capture the diversity of delivery operations across different regions, fleet sizes, and business models.
- GHG emissions reduction estimates do not account for the emissions increase resulting from additional electricity consumption.

Data Sources

Table 25. Data Sources for Measure T-3 GHG Quantification

Data Source	Application
FleetDNA Database	Last-mile Delivery Operations Characteristics
EMFAC2021 Model	Bay Area AQMD's Medium- and Heavy-duty Vehicles Miles Traveled and Energy Consumption for Years 2025 – 2045
Off-Road Emissions Inventory	Bay Area AQMD's Transport Refrigeration Units (TRUs) Activity for Years 2025 – 2045

GHG Quantification Results

Table 26. Annual Reduction in Scope I GHG Emissions from Measure T-3 ($MMTCO_2e$)

Source	2025	2030	2035	2040	2045
GHG Emissions Reduction from T-3	-	0.12	0.44	0.79	1.05

Measure Cost Approach

Electrifying Last-Mile Deliveries: Approach follows the same method as T-2.

Warehouse Indirect Source Rule: The assumptions made to estimate costs associated with electrifying TRUs are based on CARB's cost documentation[9].

- Capital costs associated with TRU electrification were estimated by multiplying the projected number of new purchases in each model year by the average purchase price per TRU.
- Charger hardware and installation cost was estimated assuming one level 2 charger per eTRU.
- Fuel costs were calculated by multiplying the projected annual fuel consumption for diesel by the corresponding projected cost per unit of diesel, derived from EIA's Annual Energy Outlook 2025. Electricity prices were calculated using unit prices from PG&E business electric vehicles schedule.
- Fuel consumption is based on Off-Road Emissions Inventory.
- TRU maintenance costs were estimated by multiplying the operating hours by an average maintenance cost per hour ($/hr). These per-hour costs were specific to each powertrain type and reflect differences in maintenance needs between electric and diesel TRUs.
- Reported cost estimates represent the net change in total costs between the mitigation scenario and the reference case scenario.

Cost Data Sources

Table 27. Cost Data Sources for Measure T-3.2 Cost Quantification

Metric	Data Sources
Vehicle capital costs	CARB's cost documentation
Projected diesel price	EIA's Annual Energy Outlook 2025, Table 3
Electricity price	PG&E business electric vehicles schedule
Vehicle maintenance cost	CARB's cost documentation

Results

Table 28. Measure T-3 Cumulative Costs 2025-2045 (Million Real 2025 dollars)

Category	Net Costs
Vehicle Cost	$590
EVSE Cost	$1,153
Fuel Cost	$(689)
Maintenance Cost	$(137)
Net Costs	**$918**

W-1: Support local food and organics management

Measure description: Support local governments and food recovery organizations to more effectively meet their food recovery and composting goals and overcome implementation hurdles to implement the State of California's Senate Bill 1383 goals to reduce landfilled organic waste by 75% and recover 20% of edible food.

Methodology for Estimating GHG Reductions

Modeling of SB1383 composting targets is not included in the future projections of the BARCAP GHG inventory. The BARCAP GHG inventory also does not include waste landfilled tonnage data, which is a required input to quantify this measure. The EPA's State Inventory Tool (SIT) Projection Tool was leveraged because 1) it is based on the first order decay model which matches the framework for emission estimates from the future projections of the BARCAP GHG Inventory, and 2) it uses tonnage data as an input and has default data for the state. SIT was used to calculate the percent reduction possible (statewide) from implementing SB1383 composting targets, assuming landfill profiles are fairly consistent across the state, and applied that percent reduction to the BARCAP Inventory future projection emissions values.

To determine a potential diversion rate of compostable material, ICF used waste composition data from CalRecycle. The SB1383 organic waste diversion target of 75% was used, but delayed the attainment year to 2035, and applied that diversion rate to the share of landfilled waste that is assumed to be organic based on the composition data. The default SIT projected tonnage data was adjusted to reflect the organic waste diversion and applied the resulting change in landfill emissions to the BARCAP Inventory.

The future projections of the BARCAP inventory for composting was used to calculate an increase in composting emissions based on the amount of additional waste diverted to composting. Because SIT uses the first order decay model to estimate emissions, the waste emission reductions are spread out over decades. Therefore, during the initial years of measure

implementation, the measure creates positive emissions. However, the measure causes emission reductions beginning in 2036 and the net emissions from 2025 to 2045 are negative (see Table 30).

Assumptions

- 30% of landfilled waste is compostable. Based on CalRecycle waste composition data.
- The composting rate for landfilled waste in the measure scenario increases linearly from 0% above the current existing rate in 2025 to 75% above the current existing in 2035. These are increased diversion rates above current levels.
- Assumed no improvements to compost management over time, compost emission factors stay the same.
- Assumed compost factors are the same as the BARCAP Inventory compost factors.

Limitations

- The SIT Projection Tool assumes the waste composition of all landfills is the same. The tool does not allow for variation to the waste composition. This limitation of the tool will result in an underestimation of emission reductions for this measure as organic waste generates more methane when landfilled than non-organic waste.

Data Sources

Table 29. Data Sources for Measure W-1 GHG Quantification

Data Source	Application
CalRecycle Waste Composition	Percent of landfilled waste that is compostable
Nordahl et al., 2023	Composting emission factors

GHG Quantification Results

Table 30. Annual Reduction in GHG Emissions from Measure W-1 ($MMTCO_2e$)

Source	2025	2030	2035	2040	2045
Landfill Methane Emissions	-	(0.02)	(0.02)	0.00	0.01

Table 31. Annual Reduction in Waste (tons) from Measure W-1

Source	2025	2030	2035	2040	2045
Compostable Waste	-	1,700,499	3,154,113	2,923,274	2,707,626

Measure Cost Approach

To calculate the costs of this measure, StopWaste provided cost data from similar food recovery programs. This data was used to estimate the cost of county-level government staffing, food bank participation, food recovery organization stipends, diversion strategy pilots, and food system research and marketing.

Cost Data Sources

Table 32. Cost Data Sources for Measure W-1 Cost Quantification

Data Source	Application
StopWaste	Cost data from similar organic waste diversion programs

Results

2025-2045 cumulative cost: a net cost of $58 million (2025$ real).

Table 33. Measure W-1 Cumulative Net Costs 2025-2045 (Million Real 2025 dollars)

Category	Net Costs
Total Net Cost	**$58**

P-1: Increase development of local clean energy and storage projects, including behind-the-meter and distributed energy resources

Measure description: Develop small- to medium-scale local clean energy and storage projects (<20MW) that contribute to meeting state goals and exceed anticipated behind-the-meter (BTM) deployment, and support an equitable and affordable transition to clean energy in the BARCAP region. Focus projects where it is the best possible use of land given local and regional considerations (e.g., brownfields, rooftops, parking lots, capped landfills, under-utilized plots). Clean energy and storage projects might include but are not limited to BTM (including rooftop solar), community solar, microgrids, agrivoltaics, and feed-in tariffs. These projects might include storage or storage might be deployed as a standalone project.

Methodology for Estimating GHG Reductions

As a first step, sources for current installed capacity of renewable energy and storage resources in the BARCAP region were identified. This was followed by identifying existing planning processes which forecast renewable and storage resources, preferably at the utility or zonal level. For BTM solar and storage the 2024 IEPR forecast for PG&E was used, while for utility-scale resources the California Independent System Operator (CAISO) Transmission Planning Process (TPP) Busbar Mapping was used. TPP Busbar Mapping generally locates different utility-scale renewable energy and storage resources to various zones within CAISO's footprint to identify transmission constraints and support transmission planning needed to meet state goals. For utility-scale resources, CEC data was used to identify the current installed capacity in the BARCAP region. Starting in 2030, incremental capacity by technology type was added based on the values for the PG&E Greater Bay Study Area through 2040 from CAISO TPP Busbar Mapping. For 2045, the average growth rate across the forecast period was used (the study only included capacity projections through 2040). The future emission projections of the GHG inventory are based on the 2022 Scoping Plan Reference Case, which includes SB100 power sector targets through 2030. As such, the measure modeling only includes growth in grid-scale resources after 2030, assuming the near-term capacity is already included in the baseline.

For distributed resources, the measure quantifies the avoided emissions of incremental BTM solar. To develop a BTM solar forecast, the growth rates from the IEPR 2024 Low and High scenarios were applied to the starting capacity to forecast growth in the BARCAP region through 2040. For 2045, the growth rate in 2040 was assumed to be constant (the IEPR forecast only includes capacity projections through 2040). For 2025-2030, the delta in BTM solar capacity from the Low and High IEPR scenarios was used to represent growth above

what's included in the baseline. After 2030, the IEPR High forecast is used and assumed to be fully incremental.

Once incremental capacity additions were established, generation based on CEC historical capacity factors for each resource type was estimated. Avoided GHG emissions using a regional grid emissions factor (ton/MWh) were then estimated from the NREL Cambium Standard Scenarios for CAISO. This reflects the potential emissions reduced both within and outside of the BARCAP region from reduced generation from fossil fuel-fired power plants located across the region that may supply power to the BARCAP region.

Limitations

- GHG emission reduction boundary: The BARCAP region is part of the interconnected CAISO electricity system, allowing for both imports and exports of electricity. As a result, changes in electricity supply and demand within the BARCAP region – such as increased BTM solar generation or demand from EV charging – may not directly reduce natural gas generation within the region. Natural gas power plants in the BARCAP region may also serve broader CAISO demand and may export electricity outside the region. Conversely, power plants outside the region can contribute to electricity consumed within it. Therefore, GHG emission reductions are evaluated using a *consumption-based* approach to estimate avoided GHG emissions from power plants but cannot be directly compared to the Scope I GHG inventory and future emissions for the BARCAP region, since those only cover power plants located within the region.
- Developing regional estimates: The BARCAP region does not directly overlap with geographies used for electricity system operations or planning, nor jurisdictions for which data can be downloaded (i.e., county). This created challenges with allocation of existing and future generation resources in the BARCAP region. The BARCAP region includes all of Alameda, Contra Costa, Marin, Napa, San Francisco, and San Mateo counties, as well as parts of Solano and Sonoma counties. The PG&E Greater Bay Study Area seems to include all of Alameda, Contra Costa, San Francisco, San Joaquin, San Mateo, and Santa Clara counties, while the PG&E North of Greater Bay Study Area includes all PG&E territory north of the counties within the PG&E Greater Bay Study Area. Therefore, the estimated capacity to meet state goals does not perfectly represent what might be assumed for the BARCAP region. Taken together, the planning and data sources in Table 38 estimate a combined total increase of GW of up to one-third in 2030 and five times in 2045 compared to 2025 levels for clean energy and storage in the Bay Area region and some neighboring counties. This approach focuses on total capacity, while the measure focuses on small- to medium-size projects to help meet the capacity needs.
- Solar mix: The modeling does not make assumptions about the types of solar facilities that will be deployed.
    - Different BTM system types (rooftop, carport, etc.) and sizes (e.g., 10 kW residential and up to 1 MW commercial systems) will have very different project costs and impact different customer segments for potential electric bill impacts. The goals and quantification represent generic grid-connected and BTM resources and provide an indicative order or magnitude of potential emission reductions and costs. For example, installing 1,000 10 kW residential rooftop systems in one year would amount to 10 MW of BTM solar capacity and could

cost nearly $29 million for upfront system costs. Annual electric bill savings could total $8,000 per year per household. Commercial system costs and bill impacts may vary greatly depending on any needed site infrastructure upgrades, system size (could range from 100 kW to 1 MW), and utility rate structure.

- Similarly, grid-scale solar facilities face varying costs related to siting and interconnection based on size and location. At the end of 2024, the CAISO interconnection queue contained over 90 GW of active grid-scale solar capacity proposed across 279 projects, the majority of which are hybrid projects (e.g., solar+battery). Only 8 projects are less than 20 MW in size (128 MW total capacity); 29 are 20-80 MW (1.4 GW total capacity), and 242 projects are greater than 80 MW.[10] Based on NREL's capital and fixed O&M cost estimates for 2025, a 20 MW grid-scale facility would cost nearly $30 million to install, with recurring $420,000 annual fixed costs.

Data Sources

Table 34. Data Sources for Measure P-1 GHG Quantification

Data Source	Application
Busbar Mapping for the Proposed Decision 25-26 TPP Base Case	CAISO Busbar Mapping summary of the initial mapping results and data used to conduct the mapping and assess the criteria alignment. Values from the Summary_byCAISO_zone tab used to identify forecasted renewable energy resource capacity in the PG&E Greater Bay Study Area and North of Greater Bay Study Area for 2030, 2035, and 2040.
Behind-the-Meter Distributed Generation Forecast Results: High Case	CEC Behind-the-Meter Distributed Generation Forecast Results. Used the 2024 IEPR PG&E Planning Area PV and Storage Forecasts for 2023, 2025, 2030, 2035, and 2040 across the Base, Low, Medium, and High sensitivities to calculate forecasted growth rates for behind the meter solar and storage.
Utility Renewable Capacity by Type and County: 2023 | California Energy Commission GIS Open Data	CEC Utility Renewable Capacity by Type and County: 2023. Used to quantify the current capacity of utility-scale renewable energy resources in BARCAP counties.
Solar PV Capacity for Systems 1 MW and Smaller: 2023 | California Energy Commission GIS Open Data	CEC Solar PV Capacity for Systems 1 MW and Smaller: 2023. Used to quantify the current capacity of small scale (<1MW) solar PV in BARCAP counties.
California Energy Storage System Survey	CEC California Energy Storage System Survey. Used to quantify the current capacity of residential and commercial energy storage in BARCAP counties.
CaliforniaDGStats	PG&E Distributed Generation (incl. NEM/NBT NEM PV) Interconnection Data Set. Used to validate capacity of behind the meter resources in BARCAP counties.
NREL Cambium 2024 Standard Scenario	CO_2 emissions factor projection for the regional grid.

Data Source	Application
CEC Capacity Factor Data	Used to estimate generation from the new renewable resources.
NREL ATB 2024	Source for capital and operating & maintenance costs for distributed solar and grid-scale solar and wind.

GHG Quantification Results

Table 35. Annual Avoided Emissions from Power Generation ($MMTCO_2e$)

Avoided Emissions	2025	2030	2035	2040	2045
Solar	-	-	0.019	0.111	0.254
Behind-The-Meter Solar	0.004	0.019	0.076	0.087	0.065
Wind	-	-	0.048	0.032	0.016
Total	0.004	0.019	0.143	0.229	0.335

Measure Cost Approach

The costs that would be incurred to build the additional renewable resources in the region were evaluated, focusing on capital and operating and maintenance (O&M) costs. Bill impacts were also estimated based on reductions in electricity purchased from the grid due to behind-the-meter solar.

Data Sources and Assumptions

- NREL's 2024 Annual Technology Baseline was used to provide capital costs and fixed O&M costs for the new utility-scale solar, onshore wind, and behind-the-meter solar. NREL's Moderate scenario projections were used, which include declines in technology costs over time. Costs were multiplied by the new capacity coming online in the region over time.
- All costs are provided in 2025 real dollars.
- Baseline electricity prices were based on the average regional non-CARE residential rate under PG&E's base plan in summer 2024.
- Electricity prices were assumed to escalate at 6.18% annually based on E3's analysis of historical PG&E trends.

Results

2025-2045 cumulative cost: a net savings of $16 billion (2025$ real). This measure results in an overall cost savings due to the large potential for reduced electricity bills, given the region's higher than average electricity retail rates.

Table 36. Measure P-1 Cumulative Net Costs 2025-2045 (Million Real 2025 dollars)

Technology	Net Costs (2025$ Million)
Utility-Scale Solar	$10,389
Wind	$771
Behind-The-Meter Solar	$(27,238)
Total	**$(16,078)**

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

Measure description: Prevent losses of carbon held in NWL from development and wildfire, while managing and restoring key carbon-rich lands to maximize carbon sequestration.

This measure addresses the challenge of predicted losses of carbon stocks which are expected statewide through the mid-century. Enhancing carbon sequestration and increasing carbon drawdown must build on a foundation of protecting existing pools of carbon held in regional natural and working lands.

Methodology for Estimating GHG Reductions

The GHG emissions and carbon sequestration associated with the conservation and enhancement of the ecosystems in the BARCAP region was calculated by comparison against the business-as-usual (BAU) land use-land use change (LULUC) scenario. The BAU scenario is based upon the Tier 3 ecosystem carbon stock inventory produced for inventory year 2022 using the methodology and datasets utilized by CARB to produce the statewide ecosystem carbon inventory. Land use change was calculated from 2002 through 2022 using the National Land Cover Database[11] (NLCD) to produce the trend for land use change from 2002-2022. This trend was extrapolated through 2045 to produce the BAU scenario.

Other land cover types from wetlands could be modelled under NWL-2. NWL-2 contains actions to support the achievement of the State of California's 30 x 30 goal[12], but the impact of achieving the 30 x 30 goal was excluded from this analysis due to the varied nature of implementation and wide range of implementers (i.e. MTC cannot achieve 30 x 30 on their own, and there are many implementers working on this landscape not named in the BARCAP).

Measure NWL-2 modelled the following goals and their positive impacts upon the landscapes and ecosystem carbon stocks in the BARCAP region, these targets reflect action NWL 2.4, which contributes to achievement of targets from the 2022 San Francisco Estuary Blueprint Task 10-1,10-2, and 10-3.[13]

1. Conservation of 20,000 acres of San Francisco Bay wetlands by 2045,
2. Restoration of 28,550 acres of wetlands by 2045, and
3. Enhancement of 3,000 acres of wetlands by 2045.

While wildfire mitigation is part of NWL 2 (Action 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*) and can be quantified using the US Forest Service First Order Fire Effects Model (FOFEM)[14], this analysis omitted this measure quantification as the level of effort required far exceeded the scope of this project.

The land use change projection was adjusted from the BAU to quantify the enhancement of wetland systems, in alignment with NWL 2.4 (*Protect carbon held in the Bay Area's wetlands through protection, restoration, and enhancement of tidal marsh habitat*). Enhanced landscapes were assumed to be implemented on wetlands that were already in the wetland category.

Similarly to conserved lands, implementation was calculated to occur linearly from 2026 – 2045. Ecosystem carbon gains from implementation of enhancement activities were calculated using the IPCC land improvement multiplier.[15]

Assumptions

- Conserved lands were assumed to be the prevented transition of wetlands from developed lands and shrublands.
- The increased ecosystem carbon stock from avoided conversion was assumed to be the difference between the average carbon stock density of the conserved land cover category (i.e. wetlands) and the avoided conversion category (i.e. developed lands and shrublands).
- Land conservation and enhancement activities were assumed to commence in 2026 and conclude in 2045.
- The wetland restoration, enhancement, and conservation targets under this measure (28,500 acres, 3,000 acres, 20,000 acres; respectively) are consistent with Task 10-1,10-2, and 10-3 of the 2022 San Francisco Estuary Blueprint. Despite the Blueprint referencing 2050 as an endpoint, this analysis suggests 2045 instead for continuity with other metrics.

Limitations

- The BAU scenario is based on a historical trend of land use/land use change and does not account for the value of developed lands in the BARCAP region.
- This scenario analysis does not account for the impacts of climate change, wildfires, or other natural disturbances on ecosystem carbon stocks.

Data Sources

Table 37. Data Sources for Measure NWL-2 GHG Quantification

Data Source	Application
LANDFIRE Existing Vegetation Cover, Existing Vegetation Height, and Existing Vegetation Type	Used to map out precise land cover and crosswalk to the CARB database for ecosystem carbon stock by land cover type.
National Land Cover Database | U.S. Geological Survey	Create a historical land cover/land cover change trend from 2002 – 2022 for use in the BAU projection to 2045.
Aboveground live carbon stock changes of California wildland ecosystems, 2001–2010 - ScienceDirect	Ecosystem carbon stock densities of land cover types in the BARCAP region.
IPCC 2019 Refinement to the Guidelines for National GHG Inventories - Volume 4, AFOLU	Improvement multiplier for ecosystem carbon stock on wetlands that receive enhancement or restoration activities.

GHG Quantification Results

The table below shows the annual reduction in GHG emissions. Note that all measures are NA for 2025 because this analysis assumes NWL GHG reduction activities will begin in 2026.

Table 38. Annual Avoided Emissions from NWL-2 Measure ($MMTCO_2e$)

Source	2025	2030	2035	2040	2045
Conserve 20,000 acres of wetland	NA	0.20	0.20	0.20	0.20
Restore 28,500 acres of wetland	NA	0.36	0.36	0.36	0.36
Enhance 3,000 acres of wetland	NA	0.05	0.05	0.05	0.05
Total	**NA**	**0.61**	**0.61**	**0.61**	**0.61**

Measure Cost Approach

Cost Data Sources and Assumptions

The cost of implementation was calculated on a per unit area basis based on the best available data from published literature. Please note that the San Francisco Estuary Partnership has their own cost estimate listed as part of the 2022 Blueprint. This analysis offers a separate, but not conflicting, data point for potential cost of implementation. The 2022 Blueprint estimates an implementation cost of over $100 million each for Tasks 10-1 and 10-3, and up to $100 million for Task 10-2. While the combined cost estimate from the 2022 Blueprint is higher than the estimate from this analysis, the discrepancy in costs may have occurred due to partitioning of activities. For example, both Tasks 10-2 and 10-3 from the 2022 Blueprint seem to both consider the cost of enhancing tidal habitats, rather than breaking them out into separate cost categories. In contrast, this analysis consolidates overlapping activities into single cost categories, yielding a conservative, area-based estimate. The 2022 Blueprint is updated every 5 years; implementers may update these costs or incorporate their own analysis to reflect current research/implementation conditions.

For the purposes of this NWL-2 action, calculation of the annualized cost of implementing NWL wetland restoration and enhancement actions per year over a 20-year time horizon utilized the following multipliers:

- Conservation: $1,600/acre.
    - Cost estimate from Hansen et al. (2015)[16]. Although the suite of practices for conservation is not as well documented as restoration or enhancement, it is assumed to be less invasive and less expensive as it consists of protecting prior-existing wetlands rather than reconstructing or manipulating hydrology, vegetation, and soil to re-establish wetland functions. Hansen et al. (2015) is meant to describe conservation/restoration of new wetland, for this reason, the lower bound from that source was used. A supporting graphic (Hansen 2015)[17] from the same author further corroborates this cost estimate.
- Restoration: $2,300/acre.
    - Cost estimate from Hansen et al. (2015). In the language of the cited paper "conservation" is defined as "restoring or preserving a new wetland"; as made evident in the Hansen 2015 graphic. The upper bound from this estimated range

was used in this analysis to account for inflation since 2015. In a 2024 report on Restored Wetlands in the CA Central Valley[18], USDA NRCS cites Hansen et al. (2015) and quotes "up to $3,000" as the per-acre cost of wetland “restoration” further corroborating this assumption.

- Enhancement: $6,118/acre.
    - Cost estimate from the Delta Working Lands Program report.[19]
    - In Delta Working Lands Program report, this figure is referred to as the average cost of "wetland restoration", but the description of the implementation more accurately reflects wetland enhancement due to the heavy manipulation of soil and hydrology.

Results

Table 39. NWL-2 Measure Cumulative Net Costs from 2025-2045 (Million Real 2025 Dollars)

Action	Net Costs
Conserve 20,000 acres of Wetland	$32
Restore 28,500 acres of Wetland	$66
Enhance 3,000 acres of Wetland	$18
Total	**$116**

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

Measure description: Increase carbon draw-down into agricultural lands by scaling up climate beneficial agriculture and reducing implementation challenges, helping to achieve state and local governments’ agricultural targets and goals. Explore areas to increase cross-sector benefits and GHG emission reductions through energy-efficient sustainable water management and integration of renewable energy on agricultural lands.

Action 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*) calls for implementation of scaled adoption of climate-beneficial agriculture practices including silvopasture, hedgerows, cover crops, conservation cover, windbreaks, compost application, riparian forest buffer, and critical area planting.

Methodology for Estimating GHG Reductions

The quantitative GHG benefits for measure NWL 3.1 were calculated through the following quantifiable implementation actions, all summing to ~36.5% (this figure comes from a proportional scaling of the 2024 California Nature-Based Solutions Climate Targets[20] to BARCAP region crop area, as established in 2022 Inventory):

- Apply compost to 10% of croplands,
- Implement cover cropping on 10% of croplands,
- Plant hedgerows on 5% of croplands,
- Increase riparian buffers by 5% on croplands/grazing lands, and

- Implement no-till on 6.5% of croplands.

The benefits were calculated using the Tier 3, California-specific California Department of Food and Agricultures (CDFA) COMET-Planner tool[21] for the Healthy Soils Program (HSP). This is a CPRG approved tool for both GHG and cost quantification that offers the additional benefits of reflecting the unique ecosystems and implementation measures in California.

Benefits were calculated on a per unit area basis.

Assumptions

- GHG and cost benefits of measure implementation were assumed to be consistent with the outcomes estimated by the CDFA COMET-Planner tool for the Healthy Soils Program.
- Compost was assumed to be applied to 10% of croplands (~17,500 acres) from 2026 through 2045; the annual acres implemented was ~900 acres.
- Cover cropping was assumed to be implemented on 10% of croplands (~17,500 acres) from 2026 through 2045; the annual acres implemented was ~900 acres.
- Hedgerows were assumed to be implemented on 5% of croplands (~8,800 acres) from 2026 through 2045; annual acres implemented was ~400 acres.
- Riparian buffers were assumed to increase by 5% (~4,800 acres) from 2026 through 2045; annual acres implemented was ~240 acres).
- No-till agriculture was assumed to be implemented on 6.5% of croplands (~11,400 acres) from 2026 through 2045; annual acres implemented was ~570 acres.
- Compost application was assumed to be applied compost with a C/N<or=11 and purchased from a certified compost facility.
- Cover crops were assumed to be addition of legume seasonal cover crop to irrigated cropland.
- Hedgerow planting was assumed to replace a strip of cropland with 1 row of woody plants.
- Increasing riparian buffers was assumed to replace a strip of grassland near watercourses or water bodies with woody plants.
- No-till implementation was assumed to replace intensive till on irrigated cropland.
- The implementation of all practices results in a 36.5% increase of adoption on BARCAP region cropland. This figure comes from a proportional scaling of California's statewide annual healthy soils practice adoption target to BARCAP region cropland area (detailed below).
    - The figure of 36.5% was calculated based on proportional scaling from statewide to BARCAP region. Annual and perennial cropland cover ~9% of CA (9.5 million acres), and the 2024 California Nature-Based Solutions Climate Targets calls for between 140K-190K acres/year of implementation of healthy soils practices between now and 2045. Cropland covers 175,244 acres for BARCAP region (70867.52 hectares, from 2022 Inventory), and BARCAP region spans 2,751,350 acres (1,113,384.26 hectares), meaning a proportionally aligned target would be

approximately ~3,045 acres per year or ~1.74% annually (summing to ~36.5% by 2045).
    - This target is in line with the CARB 2022 scoping plan target of implementing climate smart practices for annual and perennial crops on ~80,000 acres annually.
- Percent contributions of individual practices assigned using expert judgement of feasibility and impact in the region, informed by CARB documentation.
    - All practices under this action are listed in CARB 2025 NWL Proposed Inventory for Croplands (*"Practices under this approach include compost application, cover cropping, planting of hedgerows and riparian buffers, and no-till methods, which can improve soil health, increase organic carbon content, and reduce erosion*.")[22] and also called out in CARB 2022 Scoping Plan.[23]

Limitations

- The CDFA COMET-Planner tool cannot account for variation by soil type within a county, which can vary significantly in the BARCAP region; most notably, around the organic soils of the Sacrament-San Joaquin Delta.

Data Sources

Table 40. Data Sources for Measure NWL-3 GHG Quantification

Data Source	Application
COMET-Planner (CDFA)	GHG and cost quantification for measure implementation.

GHG Quantification Results

The table below shows the annual reduction in GHG emissions. Note that all measures are NA for 2025 because this analysis assumes NWL GHG reduction activities will begin in 2026.

Table 41. Annual Avoided Emissions from NWL-3 Measure ($MMTCO_2e$)

Source	2025	2030	2035	2040	2045
Compost to 10% of croplands	NA	0.002	0.002	0.002	0.002
Cover cropping on 10% of croplands	NA	0.0004	0.0004	0.0004	0.0004
Hedgerows on 5% of croplands	NA	0.004	0.004	0.004	0.004
Increase riparian buffers by 5%	NA	0.00004	0.00004	0.00004	0.00004
No-till on 6.5% of croplands	NA	0.0001	0.0001	0.0001	0.0001
Total	**NA**	**0.01**	**0.01**	**0.01**	**0.01**

Measure Cost Approach

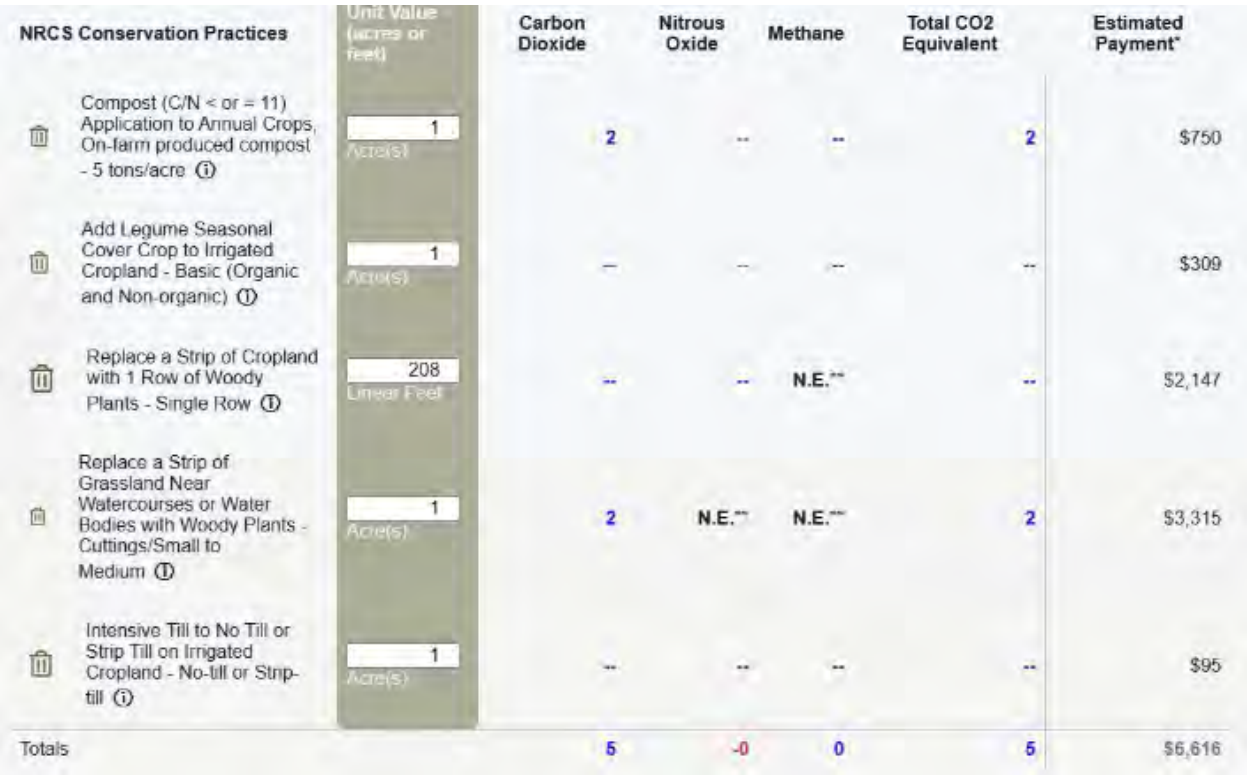
Cost Data Sources and Assumptions

To calculate the annualized cost of implementing each action per year over a 20-year time horizon, this analysis used the following multipliers, also from CDFA COMET-Planner (sub-bullets represent the terms used by COMET-Planner to describe the action):

- Apply compost to croplands: $750/acre.

    - From Compost Application (CDFA): Compost (C/N < or = 11) Application to Annual Crops, Purchased from a certified composting facility - 5 tons/acre
- Implement cover cropping on croplands: $309/acre.
    - From Cover Crop (CPS 340): Add Legume Seasonal Cover Crop to Irrigated Cropland - Basic (Organic and Non-organic)
- Plant hedgerows on croplands: $2,147/acre.
    - From Hedgerow Planting (CPS 433): Replace a Strip of Cropland with 1 Row of Woody Plants - Single Row (208 linear feet converted to 1 acre)
- Increase riparian buffers on croplands and grazing lands: $3,315/acre.
    - From Riparian Forest Buffer (CPS 391): Replace a Strip of Cropland Near Watercourses or Water Bodies with Woody Plants - Cuttings/Small to Medium
- Implement no-till on croplands: $95/acre.
    - From Residue and Tillage Management - No Till (CPS 329): Intensive Till to No Till or Strip Till on Irrigated Cropland - No-till or Strip-till

The screenshot below shows the costs directly from CDFA COMET-Planner for each of the actions.



NRCS Conservation Practices	Unit Value (acres or feet)	Carbon Dioxide	Nitrous Oxide	Methane	Total CO2 Equivalent	Estimated Payment*
Compost (C/N < or = 11) Application to Annual Crops, On-farm produced compost - 5 tons/acre	1 Acre(s)	2	--	--	2	$750
Add Legume Seasonal Cover Crop to Irrigated Cropland - Basic (Organic and Non-organic)	1 Acre(s)	--	--	--	--	$309
Replace a Strip of Cropland with 1 Row of Woody Plants - Single Row	208 Linear Feet	--	--	N.E.**	--	$2,147
Replace a Strip of Grassland Near Watercourses or Water Bodies with Woody Plants - Cuttings/Small to Medium	1 Acre(s)	2	N.E.**	N.E.**	2	$3,315
Intensive Till to No Till or Strip Till on Irrigated Cropland - No-till or Strip-till	1 Acre(s)	--	--	--	--	$95
Totals		5	-0	0	5	$6,616

Figure 4. CDFA COMET-Planner Source Data

Results

Table 46 below shows the total cost of implementing these actions.

Table 42. NWL-3 Measures Cumulative Net Costs from 2025-2045 (Million Real 2025 Dollars)

Action	Net Costs
Apply compost to 10% of croplands	$13
Implement cover cropping on 10% of croplands	$5
Plant hedgerows on 5% of croplands	$19

Action	Net Costs
Increase riparian buffers by 5% on croplands and grazing lands	$16
Implement no-till on 6.5% of croplands	$1
Total	**$54**

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

Measure description: Increase carbon stored in urban plants and soils through expansion and maintenance of green spaces that reduce the effects of flooding and extreme heat, build food sovereignty, and beautify and connect communities. Achieve these outcomes through new regional funding, staffing, and technical assistance resources. Ensure that frontline communities benefit from urban green spaces and avoid unintended consequences by supporting a policy shift towards community-led planning to embed environmental justice and anti-gentrification approaches in urban greening.

Action 4.1 (*Expand urban green spaces and prevent loss through new regional funding and technical support, prioritizing green spaces that benefit frontline communities*) calls for the contribution to and advancement beyond state and local goals for urban forestry investment and drought resistant watering. Green spaces that may garner particular focus because of air quality, environmental justice, or climate resilience benefits include parks and trees in formerly redlined or under-greened communities, community farms and gardens, freight corridor buffers, and green stormwater infrastructure.

Methodology for Estimating GHG Reductions

This methodology calculated expansion of the urban tree canopy using the land cover classifications from the 2022 Carbon Stock Inventory for the BARCAP region conducted by ICF. The implementation of this practice targets the expansion of urban tree canopy by 15% (target set by proportionally scaling the 2024 California Nature-Based Solutions Climate Targets to BARCAP region's urban area, as established in 2022 Inventory). Linear interpolation of target between years 2026 and 2045 was assumed, with high density urban landscapes (carbon density of 0 MT CO_2e/hectare) being afforested to urban forest (carbon density of 66 MT CO_2e/hectare).

Assumptions

- All existing urban tree canopy was assumed to be conserved during the measure implementation period from 2026 – 2045.
- Urban tree canopy expansion was assumed to occur on existing developed lands; land cover change for urban tree canopy expansion was assumed not to occur. This is in alignment with the assumptions of measure NWL 2.1.
- The additional ecosystem carbon stock accrued from expansion of the urban tree canopy is assumed to be the difference between the total ecosystem carbon stock for urban forest and high density urban in the CARB database.
- This methodology assumed that implementation occurred linearly from 2026 – 2045.

- The implementation of this practice targets the expansion of urban tree canopy by 15% (and conserve existing). This figure comes from a proportional scaling of the 2024 California Nature-Based Solutions Climate Targets[24] to BARCAP region's urban area (detailed below).
    - Developed lands cover ~6% of California (6.8 million acres), and the 2024 California Nature-Based Solutions Climate Targets calls for between 52.1K-52.2K acres/year of afforestation, conservation, and urban and community greening/forestry between now and 2045. Developed lands cover 753179.155 acres for BARCAP region (304800.79 hectares, from 2022 Inventory), and BARCAP region spans 2,751,350 acres (1,113,384.26 hectares), meaning a proportionally aligned target would be ~5,779 acres/year or ~0.77% per year (~15% by 2045). This target is in line with the AB 2251 directive (Calderon, Chapter 186, Statutes of 2022)[25] which sets a target to increase urban tree canopy 10% by 2035.

Limitations

- This method does not account for annual tree growth over time.
- This method does not account for differences in urban tree carbon stock based on urban forest type (e.g. Redwood versus eucalyptus groves).
- This methodology assumed that urban tree canopy expansion occurred solely on high-density urban spaces and does not incorporate urban tree canopy densification on lands that were already classified as urban canopy.

Data Sources

Table 43. Data Sources for Measure NWL-4 GHG Quantification

Data Source	Application
Aboveground live carbon stock changes of California wildland ecosystems, 2001–2010 - ScienceDirect	Ecosystem carbon stock densities of urban landscapes in the BARCAP region.

GHG Quantification Results

The table below shows the annual reduction in GHG emissions. Note that this measure is NA for 2025 because this analysis assumes NWL GHG reduction activities will begin in 2026.

Table 44. Annual Avoided Emissions from NWL-4 Measure ($MMTCO_2e$)

Source	2025	2030	2035	2040	2045
Expand & conserve urban tree canopy by 15%	-	0.56	0.56	0.56	0.56

Measure Cost Approach

Cost Data Sources and Assumptions

To calculate the annualized cost of implementing the expansion & conservation of urban tree canopy per year over a 20-year time horizon, this analysis used the following:

- Expand & conserve urban tree canopy: $1,980.20/acre

- This figure comes from the urban greening RFP response submitted by Tree Fresno to San Joaquin Valley proposing the greening of 505 acres with $1M. Tree Fresno went on to win this work and is currently under contract.[26]

Results

Table 45. NWL-4 Measure Cumulative Net Costs from 2025-2045 (Million Real 2025 Dollars)

Action	Net Costs
Expand & conserve urban tree canopy by 15%	$228

Other Measures

Greenhouse gas emissions and potential costs to implement were not assessed for five measures in the BARCAP. Measures T-4, B-3, W-2, P-2, and NWL-1 are considered supporting measures without direct GHG emission reductions themselves. As a regulatory measure, estimates of GHG reductions and costs for *W-3: Reduce Methane Emissions from Waste Management Facilities* require more detailed exploration of the options to minimize emissions of methane, volatile and toxic organic compounds, and odorous substances from organic waste handling facilities, including large composting facilities, which the Air District will conduct at a future date. Costs to implement were not estimated for supporting measures since quantifying costs requires a similar level of detailed assumptions as those used to quantify GHG reductions.

Co-Pollutants Impacts Quantification

In addition to greenhouse gases (GHGs), emissions from criteria air pollutants and their precursors (CAPs) and toxic air contaminants (TACs) can pose serious risks to public health and the environment. Like GHG inventories, tracking these co-pollutants over time helps identify what pollutants are being emitted, in what quantities, and from which key sources.

These two categories of air pollutants impact both human health and the environment:

- **Criteria Air Pollutants and their Precursors (CAPs)** include ozone, particulate matter ($PM_{2.5}$ and PM_{10}), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), and lead.
- **Toxic Air Contaminants (TACs)** include over 180 chemicals such as benzene and mercury, many of which are known to cause cancer and other serious health effects.

Two examples of important co-pollutants to assess include:

- Volatile Organic Compounds (VOCs) are gases emitted from sources such as fertilizers, paints, cleaning supplies, fuels, and building materials. VOCs react with NO_x to form ozone (a CAP), and some—like benzene and formaldehyde—are classified as HAPs.
    - The California Air Resources Board (CARB) does not report VOC emissions separately. Instead, it reports Total Organic Gases (TOG), which includes all gaseous organic compounds—both reactive and non-reactive. TOG encompasses compounds like methane and ethane, which are typically excluded from regulatory VOC definitions due to their low reactivity. For ozone-related analyses, CARB uses Reactive Organic Gases (ROG)—a subset of TOG limited to compounds that contribute to ozone formation. While TOG provides a comprehensive estimate of total organic emissions, it may overstate VOC levels compared to federal or regulatory definitions.
- Ammonia (NH_3) contributes to the formation of $PM_{2.5}$ (a CAP) by reacting with NO_x and SO_2 in the atmosphere.

Table 50 provides a summary of co-pollutant emissions in the region by sector and pollutant, with a focus on criteria pollutants. The data is compiled from the Air District's Emissions Lookup Tool[27].

Table 46. Bay Area Regional Co-Pollutant Emissions (Short Tons), 2022

Category	CO	NO_x	PM_{10}	$PM_{2.5}$	SO2	NH3	TOG
AFOLU (Agriculture, Forestry, and Other Land Uses)	4,412	1,039	2,780	649	17	2,576	14,218
IPPU (Industrial Processes and Product Use)	51,613	9,547	6,554	2,024	1,897	8	6,956
Mobile	193,890	40,043	10,443	2,243	961	1,778	16,386

Category	CO	NO_x	PM_{10}	$PM_{2.5}$	SO2	NH3	TOG
Stationary	131,115	8,920	3,176	2,660	313	4,074	64,310
Waste	544	262	1,193	231	232	535	64,421
Total	**381,574**	**59,813**	**24,145**	**7,808**	**3,420**	**8,972**	**164,293**

Methodology for Estimating Co-Pollutant Impacts

This analysis covers the entire geographic area of the BARCAP region and evaluates potential changes in co-pollutant emissions resulting from implementation of mitigation measures for the plan as a whole. The sections below describe the methodologies used to estimate changes in co-pollutant emissions. Cumulative emission reductions by pollutant across the BARCAP region are presented below.

CAPs were quantified because they are common pollutants with widespread public health impacts, causing respiratory and cardiovascular diseases, asthma aggravation, and premature death. Their reductions are directly linked to clear public health benefits and regulatory air quality standards, supported by well-established emissions factors and monitoring methods. TACs which tend to be emitted in smaller quantities with more complex sources lack widely available emissions factors, making their reductions harder to quantify.

Although TAC reductions are not quantitatively represented, the reduction of TACs that will result from the implementation of BARCAP measures will still be beneficial. Reducing energy use in buildings by increasing efficiency and transitioning to cleaner energy sources lowers the need for burning fossil fuels, which in turn can decrease emissions of TACs like formaldehyde, benzene, and other hazardous substances. When more electric vehicles are used and vehicle miles traveled decrease, emissions of hazardous air pollutants from gasoline and diesel engines, such as 1,3-butadiene, acetaldehyde, and benzene, are also reduced. These shifts generally improve air quality, lessen the public's exposure to a variety of air toxics, and support better respiratory and overall health outcomes, particularly in densely populated or heavily trafficked areas.

For PM, the values throughout the report represents the total for $PM_{2.5}$ and PM_{10} because AP-42 emission factors from EPA are not always broken out by $PM_{2.5}$ or PM_{10}. To ensure consistency across sectors, all PM is reported as PM_{10}, since PM_{10} includes all particles with diameters up to 10 micrometers, and therefore encompasses $PM_{2.5}$. However, this approach limits the ability to evaluate potential health impacts specific to fine particulates ($PM_{2.5}$), which differ from those associated with coarse particles. This limitation is acknowledged in interpreting results related to PM exposure and health outcomes.

On-Site Fuel Combustion

The following steps were used to quantify co-pollutant emission reductions from reduced on-site fuel combustion:

- Quantify Fuel Savings: Calculate the amount of each fuel type saved by comparing the baseline scenario to the mitigation scenario.
- Apply Emission Factors: Use standard EPA AP-42[28] emission factors for each fuel type to estimate emissions of NO_x, SO_2, lead (Pb), CO, and particulate matter (PM) that would have occurred without mitigation.
- Calculate Emissions Reductions: Multiply the amount of fuel saved by its corresponding emission factor to estimate the avoided emissions for each pollutant.

Mobile Source Emissions

To estimate reductions from mobile sources:

- Co-pollutant inventory data from CARB was used to determine emissions per vehicle mile traveled (VMT) for each vehicle type in the baseline year (e.g., grams of CO per passenger vehicle mile in 2025).
- Emission rates were calculated by dividing total pollutant emissions by total VMT for each vehicle category.
- These rates were then multiplied by the reduction in VMT (i.e., baseline or "business-as-usual" minus mitigation scenario) to estimate avoided emissions for each vehicle type.
- The current methodology estimates avoided emissions by applying standard EMFAC and EPA AP-42 emission factors to the amount of fuel saved. However, this approach does not account for the additional emission controls already implemented under the Air District's regulatory programs, which often result in lower effective emission rates than the AP-42 "controlled" factors. As a result, the methodology may overstate baseline emissions and the magnitude of co-pollutant reductions relative to local conditions. Unlike the Air District's approach, which applies locally derived control efficiencies and source-specific data to develop representative emission factors, this simplified method prioritizes consistency and transparency but acknowledges reduced accuracy in reflecting the Air District's actual emissions profile.

Waste

To estimate emissions reductions from solid waste measures:

- Quantify Waste Diverted: Determine the amount of waste prevented from entering landfills due to waste reduction initiatives.
- Estimate Avoided Methane Generation: Estimate the methane that would have been generated by the landfilled waste, assuming that 50% of landfill gas is methane. Any additional savings of co-pollutants that are not combusted will depend on the nature of how measure W3 may be implemented, which is not known as this time, adding to the uncertainty of these results.
- Apply Emission Factors: Use standard EPA emission factors to estimate emissions of NO_x, CO, and PM from flaring the methane that would have been produced.

Natural Lands

To assess the co-benefits of natural and working lands, EPA's i-Tree Landscape Module was used to estimate ecosystem services provided by increased tree cover. The assessment was conducted at the county level and looked at annual avoided runoff, rainfall interception, transpiration, and air pollution removal. The results showed that annually there would be 2,118 MG/yr of avoided runoff; 71,111 MG/yr of rainfall interception; and 112,283 MG/yr additional

transpiration, which helps combat urban heat island effects, enhance stormwater management by managing water volume, and improve water quality by reducing stormwater runoff and promoting infiltration. i-Tree was selected for its ability to provide standardized, spatially explicit estimates across large areas. i-Tree is an industry standard tool (employed by the California Air Resources Board NWL inventories for 2018[29] and proposed for use in 2025[30]) and was selected for use in this work to balance statewide consistency with administrative overhead. By relying on one unified data source, the use of i-Tree in this work eliminates the need to merge multiple empirical, remote-sensing, or process-based models across fragmented urban parcels, reducing uncertainty introduced by mixed data resolutions and overlapping estimation methods.

Electricity Demand Changes

Measures such as building and transportation electrification and behind-the-meter solar installations lead to changes in electricity demand. This in turn changes how power plants across the broader regions – within and outside of the BARCAP region – operate. Because the changes in power plants occur across a broader region and not just within the BARCAP region, these co-pollutant emission changes are reported separately, although a portion would likely occur within the region.

On net, electricity demand increases with measure implementation of building and transportation electrification, leading to increased co-pollutant emissions. Consistent with the methodology used for GHG emissions, changes in co-pollutant emission associated with the increases in electricity use from the implementation of this transportation and building measures were excluded from this analysis. This is a potential disbenefit to communities that live around power plants that increase their output to meet this increased electricity demand and emphasizes the importance of measure P-1, which focuses on increasing the amount of clean energy capacity deployed.

- Projected changes in the electricity grid mix from NREL's Cambium Standard Scenarios were used to estimate the net change in co-pollutant emissions across the broader power grid (which extends beyond the BARCAP region) needed to meet the increased demand.
- Emissions results are shown in Table 52 below.

Results

The co-pollutant emissions reductions from energy use reduction shown in the table results below are primarily from using less fossil fuel-intensive fuels, such as natural gas in buildings and gasoline and diesel in vehicles. These fuel shifts reduce overall fossil fuel consumption and associated emissions. In contrast, removals from natural and working lands (NWL) do not directly decrease pollution emissions but instead absorb air pollutants already released, providing complementary environmental benefits.

Table 47. Cumulative Changes in Co-Pollutant Emissions (MT), 2025-2045

Pollutant	Cumulative Reductions from Change in Energy Use	Removals from NWL
CO	245,971	14,827
NO_x	11,463	85,554
PM_{10}	630	143,734

Pollutant	Cumulative Reductions from Change in Energy Use	Removals from NWL
SO_2	123	20,300
Lead	0.01	0

Table 48. Indirect Changes in Power Sector Co-Pollutant Emissions (MT), 2025-2045

Pollutant	Cumulative Increase (MT)
NO_x	1,027
SO_2	130
PM_{10}	234
NH_3	158
VOC	76

Analysis of BARCAP Region's Contributions to State Goals by 2030

The state of California has statewide GHG emission reduction targets of 40% below 1990 levels by 2030 and carbon neutrality by 2045, with most of the goal being achieved by reducing direct GHG emissions by 85% below 1990 levels. The BARCAP aligns with and contributes to achieving the state targets. A series of sector-specific goals and the 2022 Scoping Plan (Scoping Plan) lay out the state's pathway to meet these targets, which relies on state, regional, and local action.

This first analysis examines the GHG emissions impact of meeting key sector-specific state goals in the BARCAP region. These goals were referenced in each sector chapter of the BARCAP. [31] Table 53 shows these key sector-specific state goals downscaled to the region and quantified. While meeting most goals would reduce GHG emissions, realizing the medium- and heavy-duty vehicles and landfill methane goals would result in increased emissions in 2030 as compared to 1990. For medium- and heavy-duty vehicles, this is due to the growth in numbers of medium- and heavy-duty vehicles in 2030 as compared to 1990 and for landfills methane, this is the result of organic materials that already exist in the landfills breaking down. When considered together, the regionally scaled goals listed below in Table 53 nearly achieve a 40% reduction in 2030 as compared to 1990.

Table 53. Statewide Sector-Specific 2030 Goals Scaled to the Region and Quantified

State Goal or Result	Regionally Scaled Goal or Result	Emission Reductions from Achieving Regionally Scaled Goals (MMT CO_2e)
7.1 million Light-Duty (LD) ZEVs by 2030[32]	1.1million LD EVs	12.2
155,000 Medium- and Heavy-Duty (MHD) ZEVs by 2030[33]	23,000 MHD EVs	-1.3
Deploy 6 million heat pumps and 3 million climate-ready homes[34] by 2030	900,000 heat pumps	5.9

State Goal or Result	Regionally Scaled Goal or Result	Emission Reductions from Achieving Regionally Scaled Goals (MMT CO_2e)
60% RPS by 2030[35]	60% RPS	1.8
75% waste diversion by 2025 with 20% food recovery[36]	75% diversion	0.1
40% reduction in statewide methane emissions below 2013 levels by 2030[37]	10% landfill methane control	-0.3
Industrial emissions reductions from Scoping Plan by 2030	47% reduction from 1990	7.9

The BARCAP measures help achieve the regionally scaled goals and support implementation of the Scoping Plan. For example, the state has a goal of deploying 6 million heat pumps statewide by 2030, which is roughly 900,000 heat pumps in the BARCAP region. Modeling of estimated early replacements of fossil fuel-based water and space heaters plus implementation of the Air District's Rules 9-4 and 9-6 and BARCAP measures B1 and B2 aligns with this goal. When modeling implementation of ACCII and T1, the region would adopt nearly 800,000 LD EVs by 2030, well on the path to contributing to state goals. Local actions to increase charging infrastructure are a key enabling factor to successfully achieve this goal.

The BARCAP measures also help to create enabling conditions to achieve specific state and local government climate policies and goals. This is done by focusing on what must happen regionally to support local implementation of state policies and initiatives and ensure that implementation is efficient, effective, and equitable. Though some BARCAP measures will have a direct GHG emission reduction on their own, many will also complement work at the state level or remove potential implementation barriers at the local level.

Since meeting the key sector-specific state goals scaled to the region would not achieve the state target for 2030, as shown in Table 53, a second analysis was done to show the emission reductions by sector for the BARCAP region if state, regional, and local actions are successful in fully implementing the Scoping Plan. The sector-specific emission reduction trends shown in Table 54 include the expected emission reductions for the regionally scaled goals shown in Table 53, as well as additional actions that the state has identified to fully achieve the 2030 goal statewide. When applied to the BARCAP region's GHG inventory, the emission reduction trends from the Scoping Plan demonstrate the level of reductions that might be expected to occur in the region from implementation of state policy and regulations, the BARCAP, and local climate action plans. This analysis shows that when taken together, state, regional, and local action could achieve a 45% reduction in total GHG emission reductions below 1990 levels in 2030, surpassing the state goal. Note that the significant increase in high GWP gases is due to the increase in the use of these gases as refrigerants in 2022 and 2030 as compared to 1990.

Table 54. Scoping Plan Aligned Projections for the BARCAP Region (MMTCO2e)

Sector	1990	2022	2030	% Change in 2030 from 1990
Agriculture	1.72	1.14	0.71	-59%
Power	8.17	7.08	5.92	-28%

Industrial	17.04	16.25	9.10	-47%
Waste	1.86	1.93	1.80	-3%
Buildings	8.56	7.92	6.04	-29%
Transportation	24.23	16.77	8.86	-63%
High GWP	0.19	3.01	1.47	681%
Total	**61.77**	**54.11**	**33.89**	**-45%**

The next update to the Scoping Plan is scheduled for 2027 and will incorporate the latest market trends, technological advancements, and any updates to state policies or emission targets. The state remains firmly committed to achieving its GHG reduction goals, and the BARCAP region will continue to play a critical role in supporting its success. The measures included in the BARCAP report will build upon implementation of state regulations and policies, working towards a more resilient, equitable, and low-carbon future for the region.

Methodology

Regionally Scaled Goals and Results

The sector goals shown in Table 53 were identified as key activity targets or sector results from state goals and state modeling for the Scoping Plan. To downscale these goals and results to the BARCAP region, the following approach was taken for each sector:

- ZEV Goals: Statewide ZEV adoption goals for 2030 were downscaled to the BARCAP region based on the region's population share (~15%). Using the EMFAC2021 model, the ZEV population and electric VMT fraction for 2030 were updated, and the percentage reduction in ICE VMT, along with the corresponding decrease in fuel consumption and associated GHG emissions, were estimated. This percentage reduction was applied to the vehicle emissions inventory to calculate the projected GHG reductions.
- Buildings Goal: Statewide heat pump deployment goals for 2030 were downscaled to the BARCAP region based on the region's population share (~15%). Emission reductions are inclusive of the future projections, which include the impact of Rules 9-4 and 9-6, and the impact of the building sector measures.
- Power Goal: The state's goal for the power sector for 2030 is reflected in the Renewable Portfolio Standard, which looks to source 60% of electricity from renewable energy by 2030. The GHG reductions for 2030 were taken from the Air District's GHG inventory and projections, which are based on the 2022 California Scoping Plan Reference Scenario. The Scoping Plan Reference Scenario incorporates the 2030 Renewables Portfolio Standard (RPS) target.
- Waste Goal: The state's 75% waste diversion goal by 2025 was applied directly to the BARCAP region. EPA's SIT Projection Tool was used to assess the potential GHG emissions benefit by 2030 of the waste division goal applied to the BARCAP region's waste generated tonnage. This is the same method used to quantify the GHG reductions from measure W1, and more detail can be found in that section. The main difference is that measure W1 delayed attainment of the 75% target to 2035, whereas for this 2030 analysis, the 2025 goal date was used.

The statewide methane reduction target was not directly applied to the BARCAP region. Rather, the Scoping Plan assumption of 10% landfill methane control was used to estimate potential GHG reductions by 2030. The GHG reductions for 2030 were taken from the Air District's GHG inventory and projections, which are based on the 2022 California Scoping Plan Reference Scenario. The Scoping Plan Reference Scenario incorporates the 10% landfill methane control assumption.

- Industry: Since the state does not have any GHG goals for the industrial sector by 2030, the Scoping Plan projections were used to define a benchmark GHG reduction for 2030. The Scoping Plan trendline for the state from 2022-2030 was applied directly to the BARCAP 2022 inventory. The Scoping Plan trendline was sourced from the pathways analysis[38] and compared to the state's 1990 GHG inventory data[39] to assess GHG reductions from 1990 to 2030, which showed a 47% reduction in GHG emissions.

Scoping Plan Aligned Projections

To provide a trajectory of BARCAP region GHG emissions by 2030 that align with the Scoping Plan assessment, the Scoping Plan[40] GHG trendline for the state from 2022-2030 by sector was applied directly to the BARCAP GHG inventory to develop projections to 2030 by sector.

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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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Appendix E
Engagement

March 2026

Bay Area Regional Climate Action Plan

Appendix E- BARCAP Engagement

E.1 Overview of engagement efforts

The Air District led a robust engagement process for the Bay Area Regional Climate Action Plan (BARCAP). Engagement was critical in shaping development of the BARCAP, and design of the engagement efforts reflect the Air District's appreciation for the unique challenge of creating the first-ever regional climate action plan for the Bay Area. The project builds on - without duplicating - over a decade of progress on local climate action and reflects the region's best technical and implementation work. The Air District sought to embed environmental justice throughout the engagement process, and elevated voices from frontline communities and honored them as lived-experience experts. Stakeholders were engaged early and often throughout the process by offering multiple avenues for meaningfully shaping BARCAP measures and key project areas, like the Design Principles.

The Air District engaged over **200** local government staff, **144** frontline community members, **79** technical and implementation experts, **304** public workshop participants, and **675** public survey respondents. Chapter 4 presents the high-level engagement approach and key outcomes while this appendix describes in greater detail the BARCAP engagement process, design, and outcomes.

The Air District led local government engagement, technical stakeholder working groups, and public workshops. An engagement consultant team from InterEthnica and Cascadia Consulting Group (consultant project team) were instrumental in co-leading public and frontline community engagement. Engagement was shaped by the BARCAP Outreach and Engagement Plan, which was co-developed by the consultant project team, the Air District, and several Advisory Working Group (AWG) members.

Figure E-1 shows the overall timeline of BARCAP engagement, with key engagement efforts highlighted.

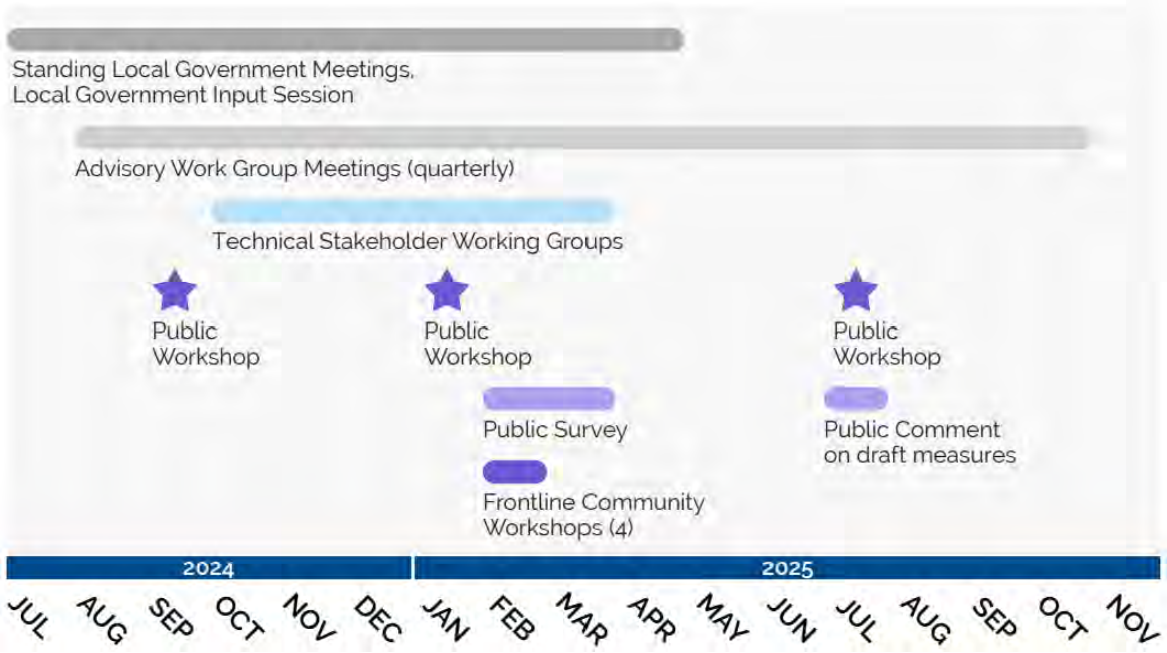


Figure E-1 Timeline of BARCAP Engagement Activities

Figure E-2 highlights the instrumental role engagement played in shaping BARCAP measure development.

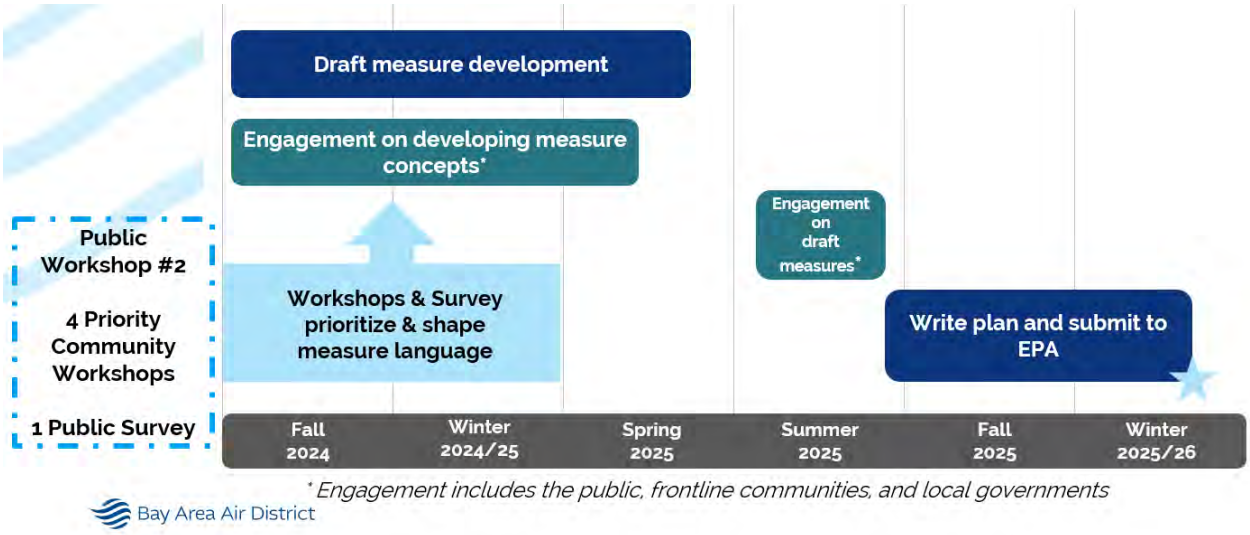


Figure E-2 BARCAP Measure Development & Engagement Timeline

BARCAP Engagement Highlights

- **Advisory Work Group (AWG)**
  - **Role in BARCAP development:** inform decisions on key aspects of the BARCAP, connect the BARCAP to communities and local governments in AWG

members' jurisdictions, discuss key challenges and important gaps to be addressed, review key deliverables
    - **Engagement approach:** quarterly, five total meetings, 25 total members
    - **Member type:** regional agencies, local governments, community-based organizations (CBOs)
    - **Key value add:** BARCAP-region geographic diversity, local government and community connections and representation
    - **Read more:** E.2 Advisory Work Group
- **Local Government Engagement**
    - **Role in BARCAP development:** identify unique regional opportunities for the BARCAP, serve as key implementation partners, provide insights into local climate action to address obstacles, scale solutions, and avoid duplication
    - **Engagement approach:** one Local Government Input session plus 11 county-led meetings, over 200 local government staff engaged
    - **Participant type:** cities and counties from BARCAP region
    - **Key value add:** local government-scale implementation focus and insights
    - **Read more:** E.3 Local Governments
- **Frontline Community Engagement**
    - **Role in BARCAP development:** update Design Principles, identify key frontline community risks and priorities to address in BARCAP measures, embed environmental justice in BARCAP measures, deepen partnerships with CBOs
    - **Engagement approach:** four subregional workshops, 144 total participants, multilingual workshops, and measure review opportunities
    - **Participant type:** frontline community members as recruited by frontline community-serving CBOs
    - **Key value add:** reflecting values and potential risks of climate action at the local scale, deepen relationships with CBOs to implement workshops and pave the way for future implementation, multilingual engagement
    - **Read more:** E.4 Frontline Community
- **Public Engagement**
    - **Role in BARCAP development:** contribute to BARCAP at key stages, reflect regional perspectives and values on climate action, provide input on measure development.
    - **Engagement approach:** three workshops with 304 total public workshop participants, one public survey with 675 respondents, one online public comment period with 409 public comments
    - **Participant type:** general public
    - **Key value add:** reflecting values and potential risks of climate action as heard from members of the public across the BARCAP-region
    - **Read more:** E.5 Public
- **Technical Stakeholder Working Groups**
    - **Role in BARCAP development:** support development of draft measures and actions for each sector based on subject matter expertise and experience and potential role as implementation partner

- **Engagement approach:** 20 total meetings across five sectors, 79 total members with additional organizations consulted on an ad-hoc basis
- **Participant type:** implementers, technical experts, community-based organizations, and local governments
- **Key value add:** implementation focus and insights
- **Read more:** E.6 Technical Stakeholder Working Groups

E.2 Advisory Work Group

The Air District established an Advisory Work Group (AWG) that met quarterly to help:

- inform decisions on key aspects of the BARCAP,
- connect the BARCAP to the communities and local governments in their jurisdictions and networks,
- discuss key challenges and important gaps to be addressed,
- review key deliverables, including the draft measures and draft plan.

In addition, several AWG members contributed to the development of the BARCAP Engagement Plan. Others served as liaisons between the AWG and the technical stakeholder working groups and attended public workshops and the local government input session described in sections E.2 and E.5, respectively. The Air District leveraged ongoing stakeholder engagement efforts led by AWG members, such as attending standing county-led local government meetings listed in Section E.3. AWG members also provided support for targeted engagement, as needed. For example, Rise South City and Climate Resilience Communities helped recruit community members to attend the Frontline Communities Workshops.

The AWG is composed of representatives from regional agencies (Air District, ABAG/BayREN, BARC, and MTC), two cities named in the federally-designated MSA (City of Oakland and City and County of San Francisco), the counties comprising the MSA (Alameda County, Contra Costa County, Marin County, Napa County, San Mateo County, and the portions of Solano County and Sonoma County that are within the Air District's jurisdiction), and several community-based and community-serving organizations (Canal Alliance, Climate Resilient Communities, Emerald Cities Collaborative Northern California, Rise South City, and Transform). Members are listed in Table E-1.

Name	Role and Organization	Regional, County, City, Non-profit, or CBO Representative
Aleka Seville	Regional Coordination Advisor, Association of Bay Area Governments/ Bay Area Regional Energy Network (ABAG/BayREN)	Regional
Allison Brooks	Executive Director, Bay Area Regional Collaborative (BARC)	Regional
Avana Andrade	Senior Sustainability Specialist, San Mateo County Sustainability Department, County of San Mateo	County
Carrie Harvilla	Deputy Director, Transform	Non-profit
Chirag Rabari	Assistant Director, Metropolitan Transportation Commission (MTC)	Regional

Cyndy Comerford	Climate Program Manager, SF Environment	City, County
Dana Armanino	Planning Manager, County of Marin	County
Elizabeth Stampe	Senior Climate Action Coordinator, San Francisco Environment Department	City, County
Jamesine Rogers Gibson	Senior Advanced Program Advisor, Bay Area Air District	Regional
Jane Elias	Program Administrator, Bay Area Regional Energy Network (BayREN)	Regional
Jody London	Sustainability Coordinator, Contra Costa County	County
Josh Bradt	Program Coordinator, Bay Area Regional Collaborative (BARC)	Regional
Julio Garcia	Executive Director, Rise South City	CBO
Kim Springer	Transportation Systems Coordinator (retired), City/County Association of Governments of San Mateo County	County
Krute Singa	Principal Regional Planner, Metropolitan Transportation Commission (MTC)	Regional
Megan Leary	Community Engagement and Policy Manager, Emerald Cities Collaborative Northern California	Non-profit
Miya Kitahara	Program Manager, Alameda County Waste Management Authority (StopWaste)	County
Omar Carrera	CEO, Canal Alliance	CBO
Ryan Melendez	Sustainability Planner, Napa County	County
Shayna Hirshfield-Gold	Sustainability Planner and Acting Sustainability Director, City of Oakland	City
Tanya Nareth	Chief Deputy Executive Officer, Sonoma County Transportation Authority/Regional Climate Protection Authority	County
Violet Saena	Founder and Executive Director, Climate Resilient Communities (CRC) and liaison to the Air District's Community Advisory Council	CBO

Table E-1 Advisory Working Group Members

The AWG met five times between August 2024 and January 2026 and discussed the following topics.

AWG Meeting Date	Summary of Discussion
August 24, 2024	• Members discussed draft priority measure focus areas, defined measure selection criteria, and identified key opportunities to include in the BARCAP: inclusive engagement including multigenerational and frontline community partnership, accelerators for building and transportation electrification, and addressing gaps in

	regional action. Other feedback included: the BARCAP should not duplicate existing local climate action planning or community engagement efforts but instead focus on being additive and complementary.
November 22, 2024	• Members discussed and provided feedback on priority measure areas and brainstormed funding and financing opportunities for priority measure areas. • Other feedback included: the need for neighborhood/community level solutions and regional coordination and examples of successful initiatives that could be effective if scaled up.
March 10, 2025	• Members discussed and provided feedback on the preliminary measures.
August 26, 2025	• Members reflected on public comments on draft measures and provided additional feedback, in addition to discussing what success means for implementation. on progress since last meeting
January 2026	• Members continued the implementation discussion and contributed to the overall implementation framework.

Table E-2 Advisory Working Group Meeting Dates & Topics Covered

E.3 Local Governments

The Air District conducted extensive engagement with local governments, recognizing them as climate leaders in the region. Local government agencies are also key stakeholders that may both benefit from implementation of the BARCAP and serve as key implementation partners.

E.3.1 Local Government Engagement Overview

The Air District met with local governments to understand their specific local needs and challenges that could be addressed at the regional level. Local government staff also helped identify opportunities for the BARCAP to advance local greenhouse gas (GHG) emission reductions. The Air District leveraged existing county-based meetings of cities and provided targeted opportunities to provide input. Local government staff also attended public workshops, participated in the Technical Working Groups, and commented on the draft measures online.

Through these engagement opportunities, local governments provided unique insights into how the BARCAP could support and accelerate local climate action by addressing obstacles and scaling solutions regionally while avoiding duplication of efforts. They also shared important equity and implementation considerations for inclusion in the plan, identified key local government roles for implementation of the BARCAP, and identified potential other implementers. In total, 65 cities and counties provided input to help shape the BARCAP.

The jurisdictions listed below participated in at least one engagement effort related to the BARCAP.

Alameda County	City of Hayward	City of Rohnert Park
City of Alameda	City of Lafayette	City of San Bruno

City of Albany	City of Larkspur	City of San Carlos
City of Antioch	City of Livermore	City and County of San Francisco
Town of Atherton	Marin County	City of San Leandro
City of Belmont	City of Martinez	City of San Jose
City of Berkeley	City of Menlo Park	San Mateo County
City of Brisbane	City of Millbrae	City of San Mateo
City of Burlingame	City of Mill Valley	City of San Pablo
City of Cloverdale	Napa County	City of San Rafael
City of Concord	City of Napa	Santa Clara County
Contra Costa County	City of Newark	City of Santa Rosa
Town of Corte Madera	City of Novato	City of Sausalito
City of Cotati	City of Oakland	City of Sebastopol
City of Dublin	City of Pacifica	Solano County
City of East Palo Alto	City of Palo Alto	Sonoma County
City of El Cerrito	City of Petaluma	City of Sonoma
City of Emeryville	City of Piedmont	City of South San Francisco
Towns of Fairfax & San Anselmo	City of Pinole	City of Union City
City of Foster City	City of Pleasanton	City of Walnut Creek
City of Fremont	City of Redwood City	Town of Windsor
City of Half Moon Bay	City of Richmond	

Table E-3 Local Governments Engaged During BARCAP Development

E.3.1.1 Standing County-Led Local Government Meetings

From July 2024 to July 2025, Air District staff attended regularly occurring local government meetings. Air District staff also met with numerous city and county staff individually for input on BARCAP measures.

Date	Meeting
7/23/24	Regionally Integrated Climate Action Planning Support Program (RICAPS)
8/27/24	RICAPS
9/17/24	StopWaste (Alameda County) Technical Advisory Group (TAG)
9/23/24	Sonoma Regional Climate Protection Authority
10/3/24	Marin Climate and Energy Partnership (MCEP)
10/22/24	RICAPS
11/19/24	StopWaste (Alameda County) TAG
12/5/24	Contra Costa Sustainability Exchange
7/15/25	StopWaste (Alameda County) TAG

Table E-4 Standing County-Led Local Government Meetings Attended by Air District Staff

Through these meetings, local government staff shared specific challenges or obstacles to implementing their local climate action plans, priority policies, programs, and other key new

ideas that might be suitable for regional, rather than local, implementation. They also identified potential opportunities for the BARCAP to help advance local action through a regional approach.

E.3.1.2 Local Government Input Session

The Air District held a virtual local government input session on April 21, 2025, to gather feedback from local government staff on the preliminary draft measures. The discussion focused on measure alignment with city and county efforts, potential local government roles in implementation, and identification of potential implementation challenges. Fifty local government staff attended, representing 27 cities and counties.

The opportunities for regional action and challenges identified by local government staff are summarized below in Table E-5. This table is a representative but not exhaustive list.

Sector	Opportunities	Challenges
Buildings	• Learn from and expand existing efforts • Partnering with distributors and manufacturers, schools, and unions • Holistic electrification programs incorporating resilience and building repair • Permit streamlining • Education for low/moderate income communities on financing opportunities and other resources for home electrification • Neighborhood/zonal electrification • Providing examples of electric equipment (e.g. HVAC, water heaters) installations in difficult or space-constrained locations • Renter protections	• Need for workforce training, growth, and support, especially for small and disadvantaged contractors • Difficulties navigating permits, permit timeliness, permit evasion • Concerns about grid reliability and backup power needs • Lack of funding • Difficulties incentivizing landlords to electrify • Affordability concerns when electrifying homes, including the purchase and installation costs of large equipment and electricity rates • Deferred maintenance and health and safety concerns making electrification difficult or expensive
Transportation	• Learn from and expand existing efforts • Partnering with other agencies, businesses, CBOs, and CCAs for charging infrastructure • Multi-agency partnership for grant applications	• Operation and maintenance difficulties regarding electric vehicle (EV) chargers • Copper theft from EV chargers • Need for greater electrical capacity and upgrades for EV charging infrastructure

	• Permit streamlining • Supporting regional electric vehicle (EV) charging infrastructure • Incentivizing public transportation • Municipal fleet electrification • Safe and protected bike and pedestrian paths • EV education • Creating a program for retiring old internal combustion engine vehicles	• Lack of data on the demand for different vehicles and types of transit • Lack of funding • Noncontiguous bike and pedestrian networks between communities • Limited staff capacity • EV affordability • Complicated logistics when siting EV charging stations on-street and on public and private property • Public skepticism surrounding EVs
Natural and Working Lands	• Learn from and expand existing efforts • Current funding for wildfire resilience • Partnering with local organizations for land conservation and urban greening • Urban forest management plans • Utilizing brownfields for solar energy generation	• Lack of urban canopy data • Concerns around gentrification and urban greening • Need for long term funding
Power	• Learn from and expand existing efforts • CPUC advocacy • Assisting local governments with technical analysis • Small renewable energy projects (20-30MW) • Long-storage and resilience projects • Community solar • Solar energy generation on brownfields • Identifying optimal sites for renewable energy projects	• Deferred maintenance delaying or inhibiting the addition of solar panels • Land restrictions • Need for emergency backup generation (which can be fossil fuel based) and concerns about related costs • Costs of batteries • Grid reliability concerns • Lack of funding/financing • Affordability concerns • Lack of political will • Equity concerns

Waste	• Learn from and expand existing efforts • Using small fees or taxes to fund food recovery and compost operations • Installing green infrastructure to clean waters entering the bay • Require compostable to-go containers and utensils • Including construction and material GHG emissions in mitigation plans • Outreach and education with restaurants regarding appliance electrification and SB1383 implementation	• Lack of CALGreen training and low enforcement • SB1383 compost contamination concerns • Need for long term funding • Need for public education on waste sorting • Storage and use of deconstructed materials concerns • Low compliance for affordable food ware ordinances

Table E-5 Ideas for Regional Action Identified by Local Governments

E.4 Frontline Community Engagement

The consultant project team, with guidance from the Air District, formed partnerships with community-based organizations to facilitate meaningful engagement with frontline communities. Frontline communities are those that bear the brunt of impacts from fossil fuel dependence and often experience the impacts of climate change “first and worst.” It was critical that the BARCAP engaged with and highlighted these important community voices.

E.4.1 Frontline Community Engagement Overview

Frontline community workshops were strategically hosted within priority areas to ensure that the lived experiences of those most impacted by climate change and fossil fuel pollution informed the development of BARCAP measures in a way that was culturally relevant and equitable. An important goal for this engagement process was to bring new voices into climate action planning in the region, particularly those who have been historically excluded and underrepresented in climate planning conversations.

The Air District and the consultant project team divided up the region into four sub-regions to reflect the local nature of frontline community concerns, while ensuring that engagement was conducted at an early enough stage for community input to shape the drafting of measures. This reflects best practices to engage early in the process, giving participants avenues to provide meaningful input into the drafting of the BARCAP. The four sub-regions were based on the presence of frontline communities, based on the map below in Figure E-3.[1] The sub-regions are further visualized in Figure E-4.

[1] https://experience.arcgis.com/experience/57bdb412b26e4f2eaf8fa762b735652f/page/Map/, for more information on how frontline communities were mapped, please click on the ‘About’ tab in the map. As described in Chapter 4-

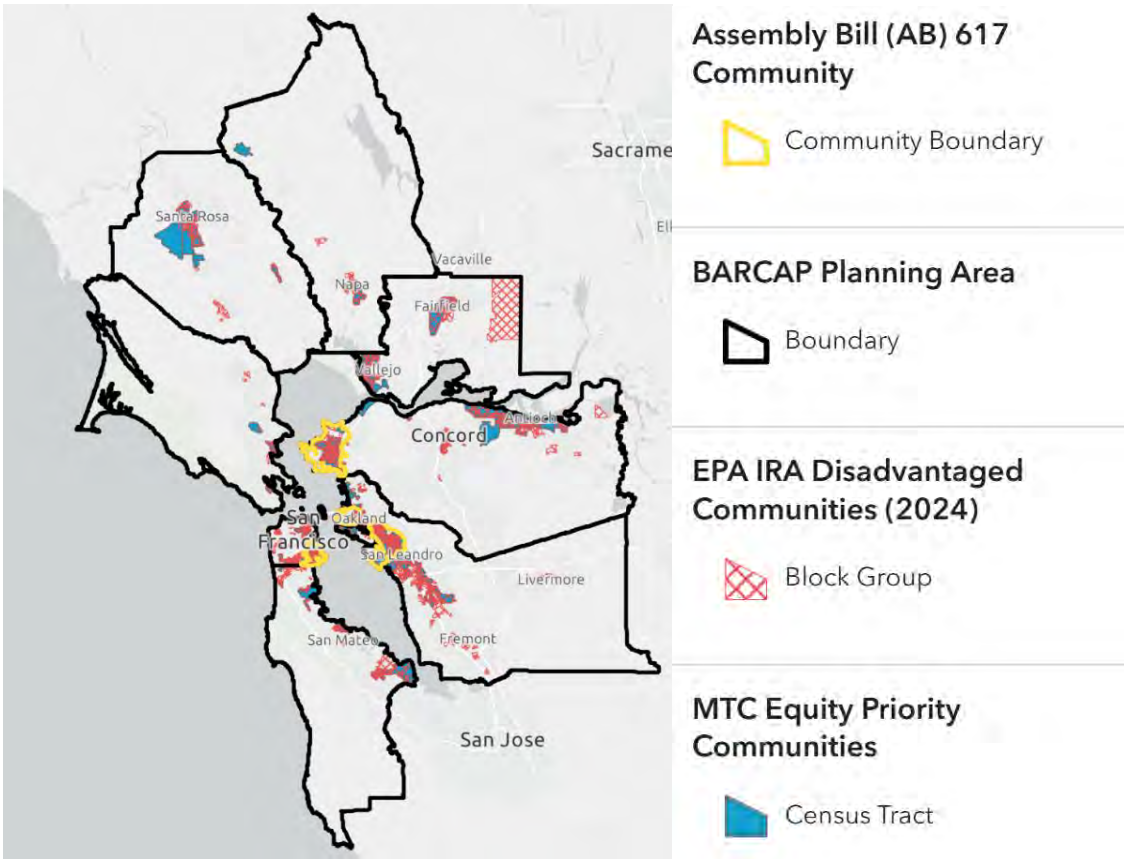


Figure E-3 BARCAP Frontline Communities

Successfully engaging frontline community members requires strong community trust and local knowledge. Community-based organizations are often 'trusted messengers' to community members. The consultant project team offered mini grants to CBOs that served as partners on frontline community engagement to compensate them for time spent inviting community members to attend workshops, reviewing workshop materials, and co-hosting workshops.

Criteria for selecting partner CBOs included:

- geography served (match to BARCAP frontline community map),
- connection to frontline community members (e.g. multilingual communities, day labor organizers),
- prior work on environmental justice issues,
- opportunity to deepen existing Air District connections, and build new relationships,
- interest and bandwidth in engaging with the BARCAP project.

Engagement- frontline communities were identified by layering AB 617 Communities, MTC Equity Priority communities, and the EPA Inflation Reduction Act Disadvantaged Communities Tool.

Frontline Community Workshops Subregions	Community-Based Organization Partners
Napa, Marin, Sonoma	North Marin Community Services Graton Day Labor Center
Alameda County	Higher Ground Neighborhood Development Corporation Hayward Community Coalition (HayCoCoa)
Contra Costa and Solano Counties	Citizen Air Monitoring Network Sustainable Solano Sustainable Contra Costa
San Mateo & San Francisco	El Concilio of San Mateo

Table E-6 Community Based Organizations and Frontline Community Workshops

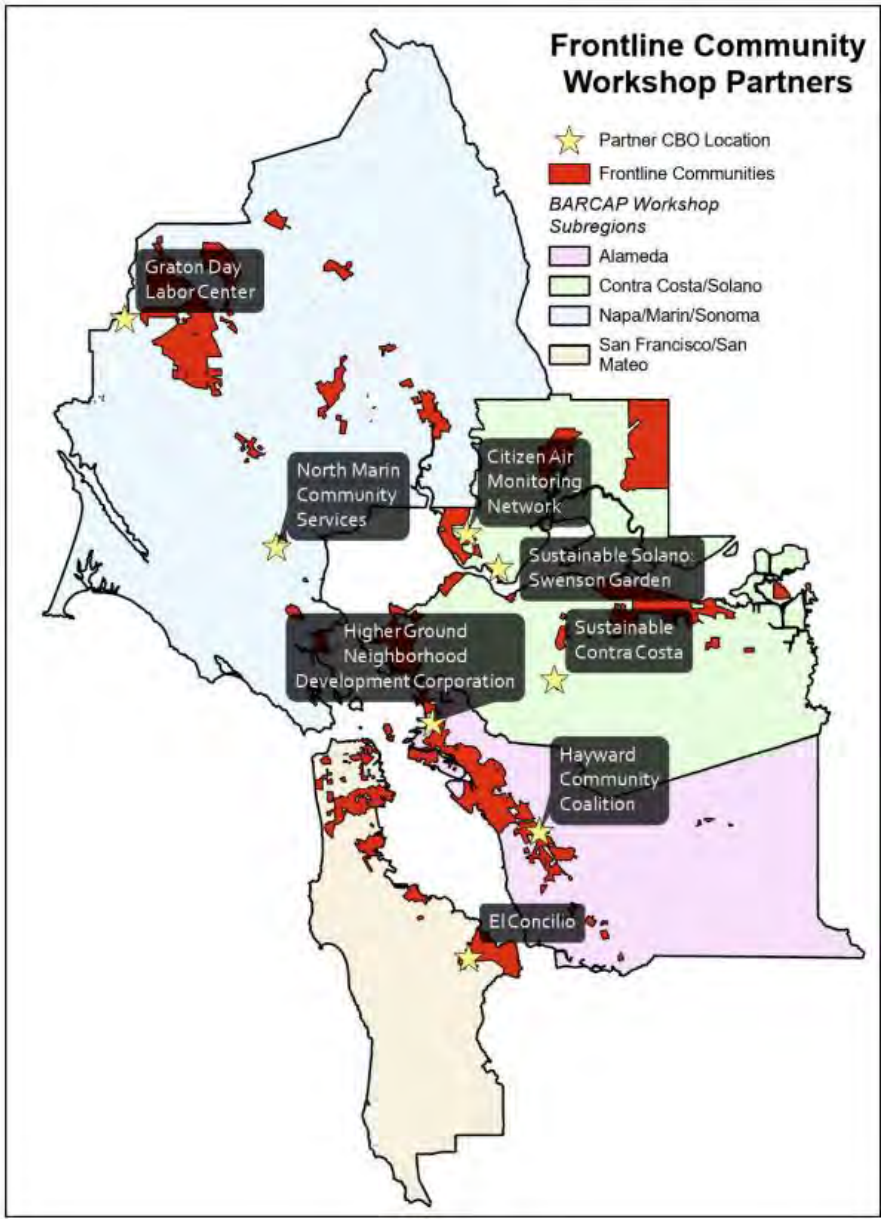


Figure E-4 Locations of Frontline Community Workshop Partner CBOs

E.4.2 Frontline Community Workshop Design

The consultant project team, with guidance from the Air District, partnered with CBOs to co-host the workshops. This approach provided localized expertise and engagement through trusted community leaders. This partnership ensured that facilitation materials were provided in participants' native languages, that materials were culturally and locally relevant (e.g. including location specific environmental justice slides), and small-group breakout discussions could be held in native languages to create comfortable spaces for deeper dialogue.

Best practices for equitable workshop design and participant engagement included:

- workshops held in evenings after workday hours, with options for hybrid or in-person as advocated for by CBOs;
- compensation provided to CBO partners and incentives provided to workshop participants, respectively, for time spent workshopping BARCAP project;
- fully multi-lingual workshops, including participant recruitment, pre-workshop communication;
- connection to community members via trusted messengers (CBOs);
- locally tailored workshop materials to reflect local concerns and conditions, CBO involvement in editing workshop materials;
- communication of climate action areas without jargon or other exclusionary language;
- clear explanation of how feedback would be used to meaningfully shape the BARCAP.

Each workshop began with an overview of the BARCAP and how community input would shape the plan's outcomes, followed by time for participants to ask questions and provide comments on draft design principles. The majority of each workshop was spent in small breakout discussions, where participants received an overview of four key sectors: buildings, transportation, waste, and urban green spaces. Breakout room facilitators then invited participants to discuss the issues that were most relevant to their community, with a focus on how community members perceive potential benefits (e.g. cleaner air) and risks (e.g. higher costs) of key areas for climate action.

Questions posed to workshop participants:

- Do the BARCAP Design Principles resonate with your lived experience and community values?
- How might preliminary areas for climate action affect your daily life (benefits and risks)?
- Are any big ideas missing?

Participants focused on the sectors and subject areas that mattered most to their community. The subregional workshops covered both the opportunities and challenges of proposed climate actions as they relate to the daily lives of frontline communities. Participants shared their communities' biggest needs to improve quality of life, including stories that emphasized **affordability, accessibility, and health.** Examples of small breakout room discussions from the Cantonese and Spanish-language breakout rooms are highlighted in Figure E-5 below.



Figure E-5 Frontline Community Waste and Green Space Brainstorm Examples

Workshop participants provided insights that directly shaped the development of BARCAP measures. These workshops created trusted spaces where lived experiences were centered and valued, and where participants were able to openly discuss the many challenges their communities face. The process not only informed the regional climate action planning effort with grounded, community-driven input but also strengthened relationships and elevated voices that are too often left out; these efforts help lay the foundation for more equitable, resilient, and inclusive climate action planning.

A high-level description of each workshop, including participation by Limited English Proficient (LEP) community members, is summarized in the workshop summary table below.

Subregional Workshop	Logistics	CBO Partners	Number of Participants LEP Participants includes Spanish and Cantonese
Alameda County	Fully Virtual Tue, February 4, 2025 6:30 – 8:00pm	HayCoCoa Higher Ground	29 Participants 45% LEP Workshop Languages: Spanish, English
Solano and Contra Costa Counties	Fully Virtual- Wed, February 12, 2025 6:00 – 7:30pm	Citizens Air Monitoring Network Sustainable Solano Sustainable Contra Costa	35 Participants 9% LEP Workshop Languages: Spanish, English
San Francisco and San Mateo Counties	Hybrid Wed, February 19, 2025 6:30 – 8:00pm	El Concilio of San Mateo	36 Participants 92% LEP Workshop Languages: Spanish, Cantonese, English
Napa, Marin and Sonoma Counties	Hybrid Thu, February 27, 2025 6:00 – 7:30pm	North Marin Community Services Graton Day Labor Center	44 Participants 93% LEP Workshop Languages: Spanish, English

Table E-7 Frontline Community Workshop Summary

E.4.2 Frontline Community Workshop Highlights & Local Insights

E.4.2.1 Alameda County

The first workshop was hosted in **Alameda County** in partnership with Higher Ground and Hayward Community Coalition (HayCoCoa). This workshop included attendees from communities in San Leandro, Hayward, Oakland, and unincorporated Alameda County, all areas that are often underrepresented in climate action planning.

In the discussions, participants emphasized the need for more green space and trees, highlighting the scarcity of parks in many neighborhoods and the direct link between green spaces and public health. They believed that by expanding green spaces they would be able to address some of the pollution in their neighborhoods, particularly in Oakland and Hayward, where community members noted that this was a significant issue. In the Spanish-speaking breakout group, they described it as “un grandísimo problema de contaminación” (a huge pollution problem). They emphasized that through community education and engagement, the green spaces can be revived, upkept, and expanded.

When discussing transportation, participants voiced that bike lanes and transit infrastructure must be designed inclusively, ensuring that older adults and people with disabilities can safely navigate streets. They expressed deep concerns about the lack of safety when riding transit, stating that it is not a safe alternative for kids, elders, and families. Participants also raised affordability issues, pointing out the high cost of public transit and financial barriers that prevent families from accessing sustainable transportation options.

Buildings were also a point of discussion; participants raised concerns of affordability if their landlords made the switch to electric appliances in their units. They noted that for this switch to take place, there needs to be tenant protections in place to prevent a surge in rental prices or unexpected fees that they cannot afford. Participants mentioned illegal dumping as a persistent issue in their neighborhoods.

E.4.2.1 Contra Costa and Solano Counties

The second workshop focused on **Contra Costa and Solano Counties**. Sustainable Solano, Citizen Air Monitoring Network, and Sustainable Contra Costa supported this workshop.

Participants emphasized the importance of making required building upgrades affordable and accessible for low-income households and renters, especially given concerns about high utility bills and unhealthy housing conditions. They suggested financial assistance programs to offer support for paying utility bills or stipends to make the required updates, particularly for renters and families who already struggle to make ends meet.

On transportation, community members shared their experiences with long commute times, high fares, especially when traveling as a family with multiple children, and health risks from exposure to refinery pollution while traveling on public transit. Participants expressed interest in introducing reliable electric buses, instead of pushing for electric vehicles that may be unaffordable for their community.

Green spaces were seen as an opportunity to improve health and increase community engagement. Participants requested more trees and parks and suggested involving youth in programs to maintain green spaces and educate their peers on the importance of these areas. Similarly, participants emphasized the importance of community education when it comes to waste. They shared that there are existing food recovery programs that would be great to partner with to avoid reinventing the wheel.

E.4.2.1 San Francisco and San Mateo Counties

The third workshop was hosted for **San Francisco and San Mateo Counties**. El Concilio partnered to engage San Mateo County residents, and InterEthnica recruited Cantonese speakers from the community. The workshop hosted frontline community participants over Zoom and in person at the North Fair Oaks Community Center.

Across building and transportation sectors, participants emphasized the importance of community engagement and education in implementing climate actions. They asked for education on electric vehicles, their environmental impact, and available programs. On buildings, they stressed the need to engage homeowners and landlords to ensure that the costs of upgrades are not passed on to tenants. They expressed the need for tenant protections during retrofits and building upgrades related to climate action to ensure housing remains affordable.

For the waste sector, participants spoke about gaps in recycling and composting systems, particularly in multifamily housing. They noted a lack of understanding and awareness about proper waste separation, with programs being inconsistently implemented across different neighborhoods. They recommended more education and outreach, in multiple languages, as well as stronger enforcement to reduce illegal dumping.

Participants emphasized the importance of increasing the number of trees and park access, particularly in dense urban neighborhoods where green spaces are limited. They asked for more shaded areas, clean and maintained green spaces (e.g. clean sidewalks), and safe green spaces where the community can gather. Participants suggested planting more trees along corridors such as Middlefield Road and ensuring that the green spaces that are developed prioritize frontline neighborhoods. They strongly recommend that community members have a voice in how green space is designed and maintained to avoid investments that do not reflect local needs or contribute to gentrification.

E.4.2.1 Napa, Marin, and Sonoma Counties

The final workshop covered **Napa, Marin, and Sonoma** Counties in partnership with the Graton Day Labor Center and North Marin Community Services. This workshop offered both in-person and virtual participation options.

This workshop brought a unique perspective to the building sector conversation. While more housing continues to be built, there is not enough water or resources in the area to support

existing and new households, according to participants. This was identified as a key risk to long-term sustainability. Across all counties, residents shared that the existing housing infrastructure needs a lot of repairs to be sustainable; this is where resources should be invested.

One key benefit highlighted was the creation of jobs through the transition to electric alternatives. Participants highlighted that there are very skilled workers who can support this work, but this opportunity needs to be open to those who are limited English proficient.

Transportation was lightly touched, participants shared that they are very reliant on their vehicles as transportation options are scarce. They shared that within their community, it is already common practice to bike, walk, or share a car to get to work.

Green space was a significant topic of discussion in this workshop, seen as critical for both environmental health and community safety. Participants suggested planting more trees and more community gardens, while prioritizing fire-resistant landscaping. Fire prevention was a recurring theme. Communities want regular pruning, removal of brush and debris, and safe disposal of plant waste to reduce fires that affect every sector. Participants saw substantial benefits with reforestation, maintenance, and community trainings to build sustainable green spaces.

On the topic of waste, they recommended stronger recycling and illegal dumping regulations, more waste containers, and education to prevent cigarette butts from being thrown out, which can spark fires. Some also suggested monitoring using cameras in remote areas to avoid illegal dumping in their green spaces and neighborhoods.

E.4.4 Frontline Community Workshop Outcomes

The frontline community workshop series resulted in several key updates to the BARCAP. Workshop participants updated draft design principles, shown in Chapter 5. A tracked changes version is shown below in Table A-8 to highlight the changes resulting from workshop participants' input.

As described in Chapter 5, the draft design principles were initially developed in 2023 in partnership with a roundtable of climate justice and equity organizations: Emerald Cities Collaborative Northern California, The Greenlining Institute, PODER, and Transform. The principles were also informed by input from local governments and regional agencies based on what they have heard directly from their communities. Updating these draft principles directly with feedback from frontline communities was an important step in ensuring that BARCAP measures reflect and elevate values from frontline communities across the BARCAP region.

Design Principle and Description + Post-Frontline Community Workshop Updates
Climate equity: Provide direct, meaningful, desired, and assured benefits to frontline communities.
Cooperative: Build upon and integrate existing efforts to expand impact, rather than introduce duplication.
Coordinated: Build cooperation and peer working relationships among local government and community-based organizations, that builds community capacity and empowers community leadership with and across counties, in consultation with community members through culturally relevant, multi-lingual, trusted-messenger-delivered outreach to reach frontline communities, and other vulnerable groups including recent immigrants, Indigenous communities, and youth.
Funding & financing: Increases access to critical financing and funding mechanisms for frontline communities and other key stakeholders (including operations and maintenance) and; identifies alternative financing mechanisms that provide sustained benefits for frontline communities.
Genuine affordability & access: Increase access to housing and, transportation, and other community benefits like green spaces, reduces or doesn't increase housing/transportation/energy costs (e.g. housing, transportation, energy) and considers options to expand , and improve access and affordability.
Health & safety: Improve living and/or working conditions (e.g. indoor and outdoor air quality, safety in green spaces, traffic safety, and pedestrian safety), especially in frontline communities.
Housing & community stability: Support people to be housed, especially renters and low-income homeowners, and remain in their homes. Consider how communities use and connect to spaces.
High-quality jobs & local entrepreneurship: Create lasting, high-quality, family-sustaining high-road jobs and other pathways to economic sovereignty in frontline communities.
Resilience: Build resilience especially for frontline communities to withstand changing climate conditions in the near and long term, increasing preparedness to respond to climate-related emergencies.

Table E-8 Design Principles with Track Changes from Workshops

Once updated to reflect feedback obtained through the workshops, the Air District assessed each potential BARCAP measure against the revised design principles to ensure alignment with the underlying concepts. The resulting list of final BARCAP measures in chapters 6-10 describes which design principles are advanced by each measure.

The Air District incorporated findings from the frontline community workshops into preliminary BARCAP measures. The result is measures interwoven with language to center and advance equity, minimize unintended consequences, and amplify values and priorities identified by communities.

Workshop participants provided feedback on key benefits and perceived risks for proposed areas for climate action. This feedback was summarized for each workshop and then combined into a list of recommended edits for each sector's proposed areas for climate action prior to formal drafting of the measures. This approach ensured that measures reflected viewpoints of frontline community members, guarded against key risks as feasible, and uplifted key quality of life improvements associated with climate action identified by community members, as summarized by the table and figure below.

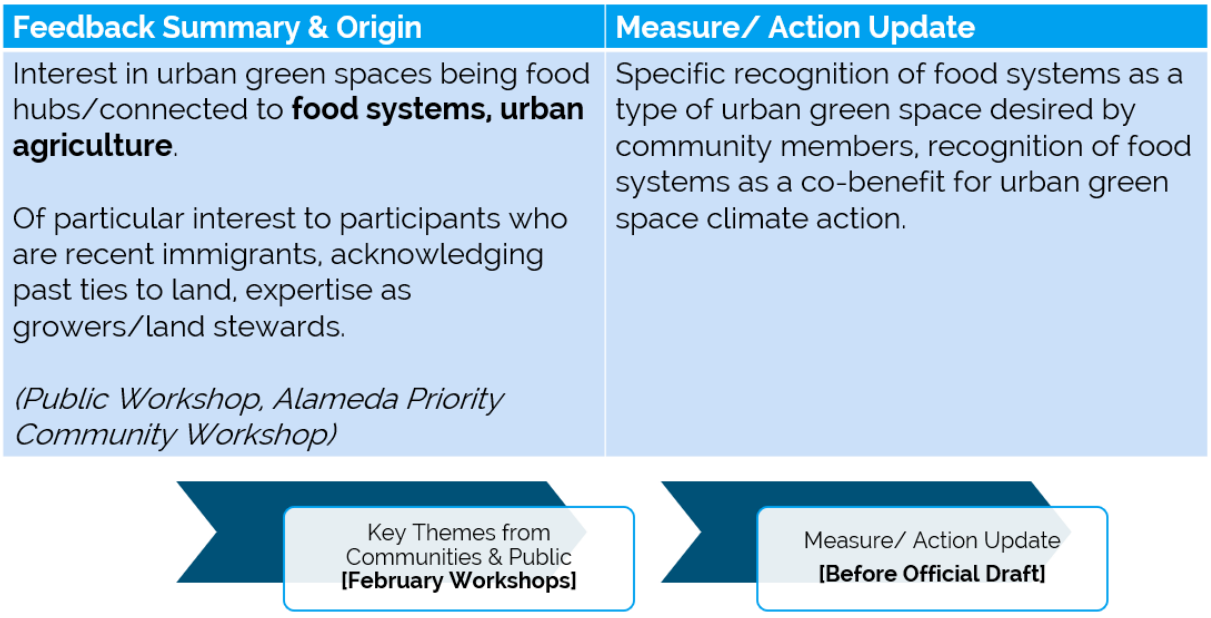


Figure E-6 Example of Post-Workshop Measure Updates

Some community feedback areas were already included in the preliminary measures (e.g. a focus on the building decarbonization workforce). These measure areas are indicated in the table below with a "*", which emphasizes that frontline community workshop feedback supports these areas for climate action. Other community feedback points were best suited for updating the overall sector framing (e.g. a new co-benefit), rather than the BARCAP measures themselves. While the priority community workshops did not explicitly focus on power, participants raised important power-related benefits and risks while discussing other sectors.

Sector	Key Measure & Action Updates Reflecting Frontline Community Workshop Feedback
Buildings	• Inclusion of affordable housing protections and multifamily building owner outreach and education • Emphasis on workforce diversity and contractor availability/training*
Transportation[2]	• Inclusion of e-commerce driven vehicle miles traveled

[2] Note that most measures related to land-use changes and active transportation are reflected in Plan Bay Area 2050+ instead of the BARCAP, as articulated in the Transportation Sector Chapter.

	• Inclusion of consideration for lowering upfront costs for EV purchase based on affordability concerns • Emphasis on prioritizing public funds to address gaps in EV charging network and address reliability concerns • Inclusion of trusted institutions (e.g. churches, CBOs) for charging sites • Inclusion of outreach and education around range anxiety, EV parts theft, and concerns about perceptions of EV safety • Inclusion of trusted messengers to expand reach of EV rebates*
Natural and Working Lands	• Inclusion of explicit mentions of indigenous land stewardship and land management practices • Inclusion of food sovereignty values and opportunities to grow food • Emphasized connections to schools for urban greening efforts • Inclusion of community planning measures to avoid space conflicts, empower communities, avoid unintended gentrification • Inclusion of opportunities for community-lead urban greening and stewardship • Emphasis on benefits for agricultural and land workers, with an emphasis on worker safety
Power	• Addition of special consideration for affordability for low-income households (in addition to current frontline communities focus) • Emphasis on crosscutting issues that can include grid reliability* • Emphasis on rate stability and affordability as key regional priorities and highlighting how actions support these goals* • Inclusion of better coordinated outreach and education about demand flexibility programs that can compensate participants* • Inclusion of opportunity presented by resilient energy resources at schools to educate youth about clean power resources and clean energy jobs
Waste	• Emphasis on community enthusiasm for food recovery and community-based food systems in general* • Inclusion of multifamily, small- and minority-owned- businesses for outreach and education on food recovery and composting efforts • Emphasis on community concern for lifecycle impacts of construction and building materials* • Inclusion of concern about waste sorting, and support for upstream solutions to reduce plastic waste like reusable foodware • Emphasis that further effective outreach is needed to achieve waste diversion goals, enthusiasm for school outreach

Table E-9 Measure Updates from Frontline Community Workshop Feedback

E.5 Public Engagement

The Air District and the consultant project team offered several avenues of engagement to the general public to learn about and contribute to the development of the BARCAP, including public workshops, a survey, and a public review and comment period. The team sought public

input before, during, and after measures were drafted. Intentions shaping public engagement were to provide a forum for meaningful engagement that was conducted early and often, with multiple avenues for members of the public to influence BARCAP measure development.

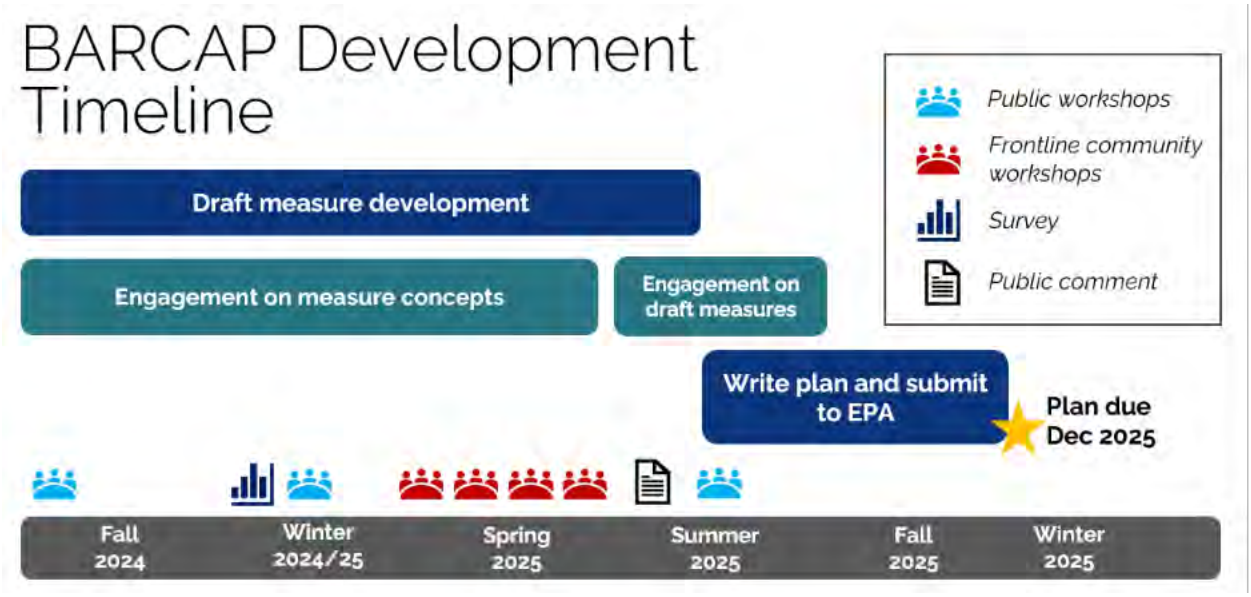


Figure E-7 Public Engagement Timeline Highlight

E.5.1 Public Engagement Overview

Summaries from public engagement, with highlights for multilingual engagement are described below.

Engagement Strategy	# of Participants	Languages Included
Public Workshops (three)	304	English with simultaneous interpretation available upon request In-language facilitation for Spanish and Cantonese were provided for the third public workshop.
Survey	675	English, Spanish
Online Commenting Platform	65 (total 409 comments)	Chinese (Traditional), English, Spanish Comments were received on English and Spanish document versions

Emailed Comments	13	English

Table E-10 Public Engagement Strategy Highlight

Public Workshop Series – 304 total workshop participants, three workshops

The Air District convened three virtual public workshops throughout the BARCAP project. Public workshops included project updates and interactive brainstorm and engagement opportunities. All workshops were held virtually and after work hours.

Interpretation was offered for all public workshops in Spanish and Cantonese. Additional multilingual facilitation was offered for the third public workshop to allow for deeper engagement during the interactive portions of the workshop. Presentation materials were also made available in Spanish and Cantonese. Additional Spanish-language engagement was conducted through AWG members who serve multilingual populations and partner CBOs from the frontline community workshop series to increase workshop attendance from targeted communities.

Public Survey – 675 survey respondents

To offer a more flexible option for input on measures, and to better understand community values and which benefits of climate action are most important, the Air District and the consultant project team launched an online climate action survey in Spanish and in English. The survey received 675 responses, with ten percent of survey respondents speaking Spanish as their first language.

Public Commenting Period – 409 public comments submitted

The BARCAP draft measures were open for public comment July 2 – 29, 2025. Comments were primarily collected via an online reviewing and commenting platform that made it easy for the public to provide comments. Through the platform, one reviewer could leave multiple comments spread across the document. Comments were also accepted via email and during the third public workshop as alternative ways for the public to provide input. The plan received 409 comments from 78 individuals, as well as verbal and chat comments received during the public workshop. For a detailed breakdown of how comments were integrated into the plan, see the “FAQ” document (link).

The BARCAP draft measures were available in Spanish and Cantonese to increase accessibility and ensure continuity and transparency from earlier multilingual engagement during the frontline community workshop series. Nine comments were received on the Spanish language BARCAP draft version.

E.5.2 Public Workshop Series

The Project team held online public workshops as an interactive, hands-on opportunity for participants to learn about the BARCAP process; share their top priorities, concerns, and feedback; and meet and connect with other community members. This was carried out through BARCAP team presentations, online brainstorming and interactive tools (e.g. Zoom Polling, Mural), and breakout groups.

Workshop # and Topic	Agenda	Workshop Highlights
BARCAP Kickoff Workshop – Workshop #1 September 30, 2024 5:30-7:00 PM	• Project Overview (timeline, progress to date, opportunities for public input) • Visioning exercise: In 2050, I want the Bay Area to be… • Polling to identify key areas for climate action • Breakout rooms envisioning the tangible daily impacts of climate action in our communities	• Attendees from across the BARCAP region identified as activists/advocates, climate professionals, or taking climate action in their everyday lives • Key areas for climate action identified included: walkable communities, solar deployment with batteries, EVs, and improved EV charging reliability • Key benefits of climate action identified included: safer active transportation options, desire for more/better electric vehicle ranges, affordability for key climate technologies (e.g. heat pumps), and high-quality jobs
Preliminary Strategies for Regional Climate Action – Workshop #2 February 11, 2024 5:30-7:00 PM	• GHG inventory draft results, key areas for climate action, and identified benefits and potential risks • Sector-specific preliminary strategies for climate action • Interactive sessions to brainstorm sector-specific climate actions,	• Received public feedback into measure and action updates before they were fully “baked,” on the same timeline as the frontline community workshops • Detailed feedback on measures at the sector level • Key takeaways across sectoral groups included: themes on equitably transitioning off gas at the neighborhood scale, concerns about potential electrical rate increases, support for 24/7 renewable energy, pathways to reduce plastic contamination and ways to boost food access, need for public education and stewardship opportunities for urban greening, emphasis on reducing vehicle miles traveled (VMT) and boosting active transportation
Draft Climate Action Strategies Deep-Dive-Public Workshop #3	• Re-introduction of BARCAP project, with highlights on how engagement shaped measure development • Overview of measure development process	• Multilingual promotion and facilitation resulted in the workshop being attended by 17 Spanish and 16 Cantonese speakers • This workshop was designed to provide an alternative to

July 22, 2025 6:00-7:30 PM	• Tutorial on how to use the online commenting platform to submit public comments • Deep-dive introduction for drafted BARCAP measures • Q&A with staff leading each sector	commenting on draft measures online or through email • This workshop served as an alternative way for Cantonese and Spanish speakers to contribute, in addition to written options in in-language online documents • Key input included the urgent need to reach carbon neutrality, concerns around costs of electric appliances and vehicles, and the importance of including young people in climate action

Table E-11 Public Workshop Summary

E.5.3 Public Survey

The Project Team launched an online survey to gather feedback from communities across the eight-county region on priorities and concerns regarding the BARCAP's goals, strategies, and proposed actions. The survey allowed the team to gather input from as many community members as possible across the wide geographic range of the region. Survey results offer additional insights into regional support for BARCAP actions, while illuminating differences in viewpoint across racial/ethnic groups and income. The survey received 675 responses, and offered an additional, multilingual, and asynchronous option for the members of the public to make their voice heard before BARCAP measures were formally drafted.

The Air District promoted the survey via community and local government networks and contacts established during the Priority Climate Action Plan (PCAP) phase. The survey was available in both English and Spanish, with the English survey opening on January 24th, 2025, and the Spanish survey opening on February 14th, 2025. Both surveys closed on April 7th, 2025.

Key results from the survey's responses include the following:

- The most popular action that survey respondents reported taking to support the climate and environment is trying to "**save resources by using less energy, water, or reduce waste when they could**" (85%, 575 respondents).
- The most observed local climate, environment, and weather pattern changes were the "**increased frequency of regional wildfires and days affected by wildfire smoke**" (76%, 504 respondents) and "**more frequent or intense heatwaves and hotter days**" (74%, 495 respondents).
- The most popular strategy that survey respondents thought the BARCAP should focus on was to produce "**all/more energy using clean, carbon-free energy sources (e.g., solar, wind, geothermal) for producing electricity**" (59%, 358 respondents). This was followed by "**expand and protect green spaces, urban trees, and natural**

ecosystems" (49%, 299 respondents) and "**shift from driving an automobile to alternative transportation modes (walking, bicycling, transit)**" (42%, 259 respondents).

- Survey respondents chose "**communities that are better able to withstand climate impacts, such as extreme heat and flooding**" (61%, 369 respondents) as the top improvement that GHG emission reductions would have on their lives.
- Lower and middle-income respondents were more supportive of "**promoting local food production and consumption, reducing food waste, and strengthening food security**" than wealthier respondents, and expressed less interest in **"transitioning to electric vehicles**" than any other strategy.
- "**Shift from driving an automobile to alternative transportation modes**" was the most selected strategy by Asian or Asian American respondents (56% support). "**Transitioning buildings away from using natural gas to all-electric**" was also popular with Asian or Asian American respondents (46% support), especially compared to Hispanic, Latino, Latina, or Latinx respondents (only 14% support). Hispanic/ Latinx respondents much preferred "**expanding and protecting green spaces, urban trees, and natural ecosystems**," as did Black/African American respondents (67% and 48% support, respectively).
- **Climate resilience** and **public health** were the most appealing benefits of climate action for Bay Area residents across a range of socioeconomic classes and races/ethnicities.
- Low-income household respondents expressed more concern about additional **cost burden** created by climate action than wealthier households, especially where that may contribute to **displacement**.

Figure E-8 (below) displays the number of survey respondents who supported each of the 13 actions listed in the survey, with a particular focus on the top five areas for climate action (listed in order of survey respondent preference):

- Produce all/more energy using clean, carbon-free energy sources (e.g. solar, wind, geothermal) for producing electricity (carbon-free energy),
- Expand and protect green spaces, urban trees, and natural ecosystems (urban greening),
- Shift from driving an automobile to alternative transportation modes (walking, bicycling, transit) (active transportation),
- Promote energy resilience, such as through battery storage, clean, carbon-free electricity sources on-site (like solar) for critical facilities, and improvements to the electric grid (energy resilience),
- Transition buildings away from using natural gas to all-electric (building electrification)

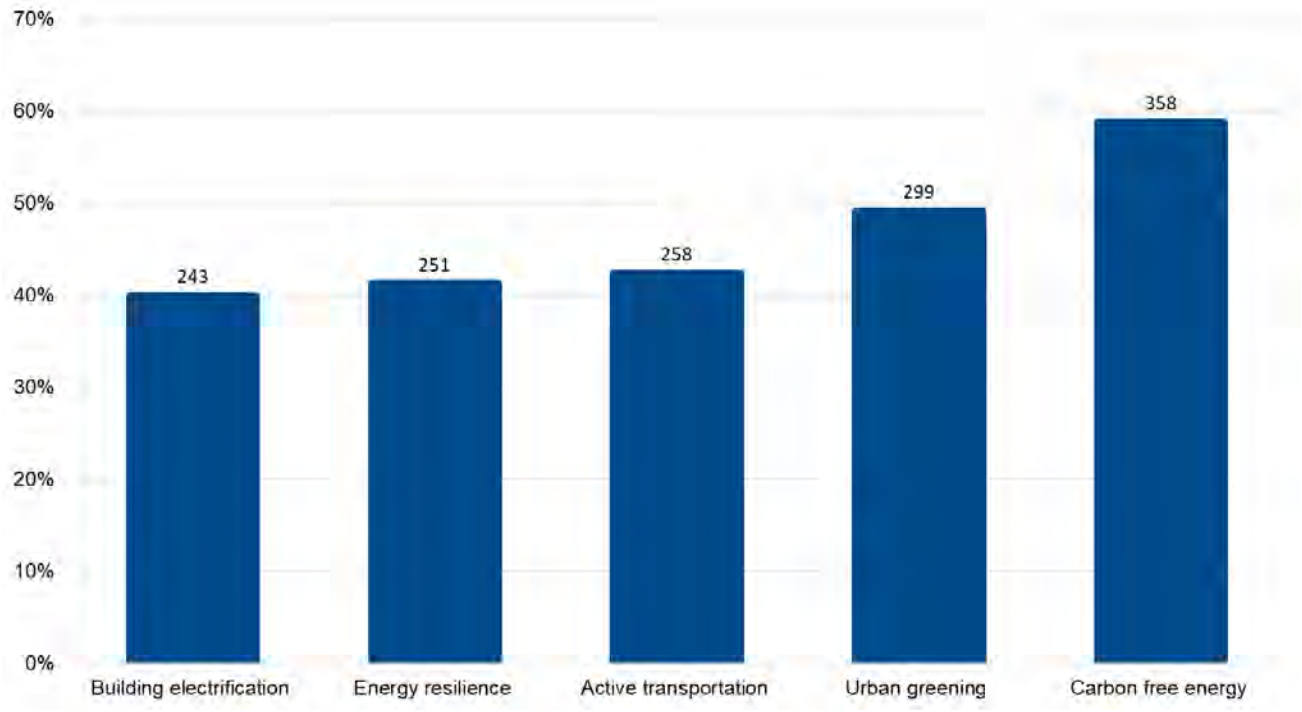


Figure E-8 Top five Strategies for Climate Action (BARCAP Survey)

Figure E-9 shows the ranking of all thirteen areas for climate action by survey respondents. Climate action descriptions are paraphrased, similar to the figure above, to improve graph legibility. It should be noted that there was respondent-wide support for all strategies- even the strategy with the lowest ranking, which promotes climate-beneficial agriculture, still made it into the top five strategies for 21% of respondents.

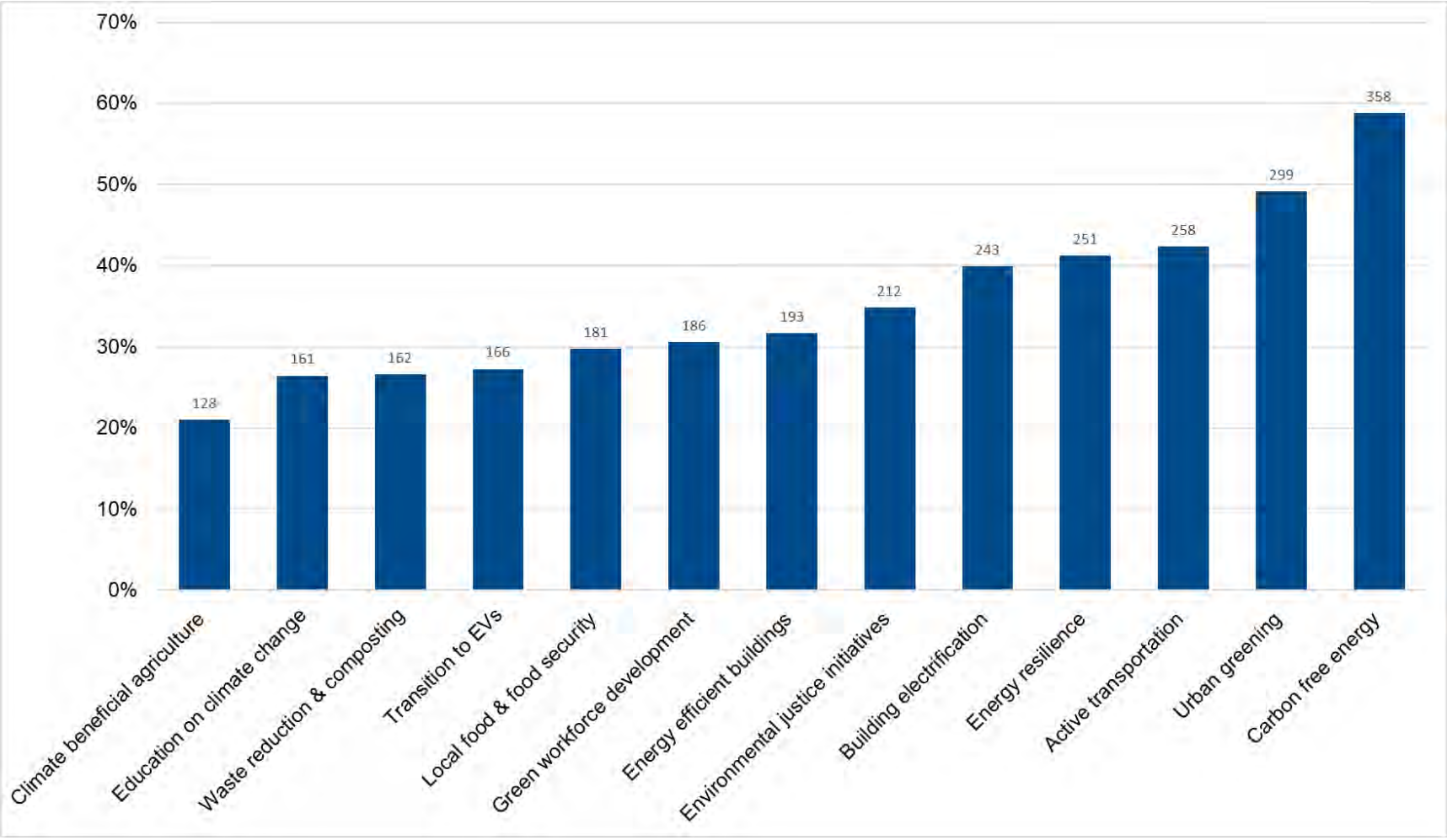


Figure E-9 Complete Ranking of All Survey Strategies for Climate Action

Survey responses to the question *"What strategies do you think the Bay Area Regional Climate Action Plan should focus on? Please choose your top five."* also highlighted differences in support for climate actions across income levels and race/ethnicity groups, as shown below in Figure E-10 and Figure E-11.

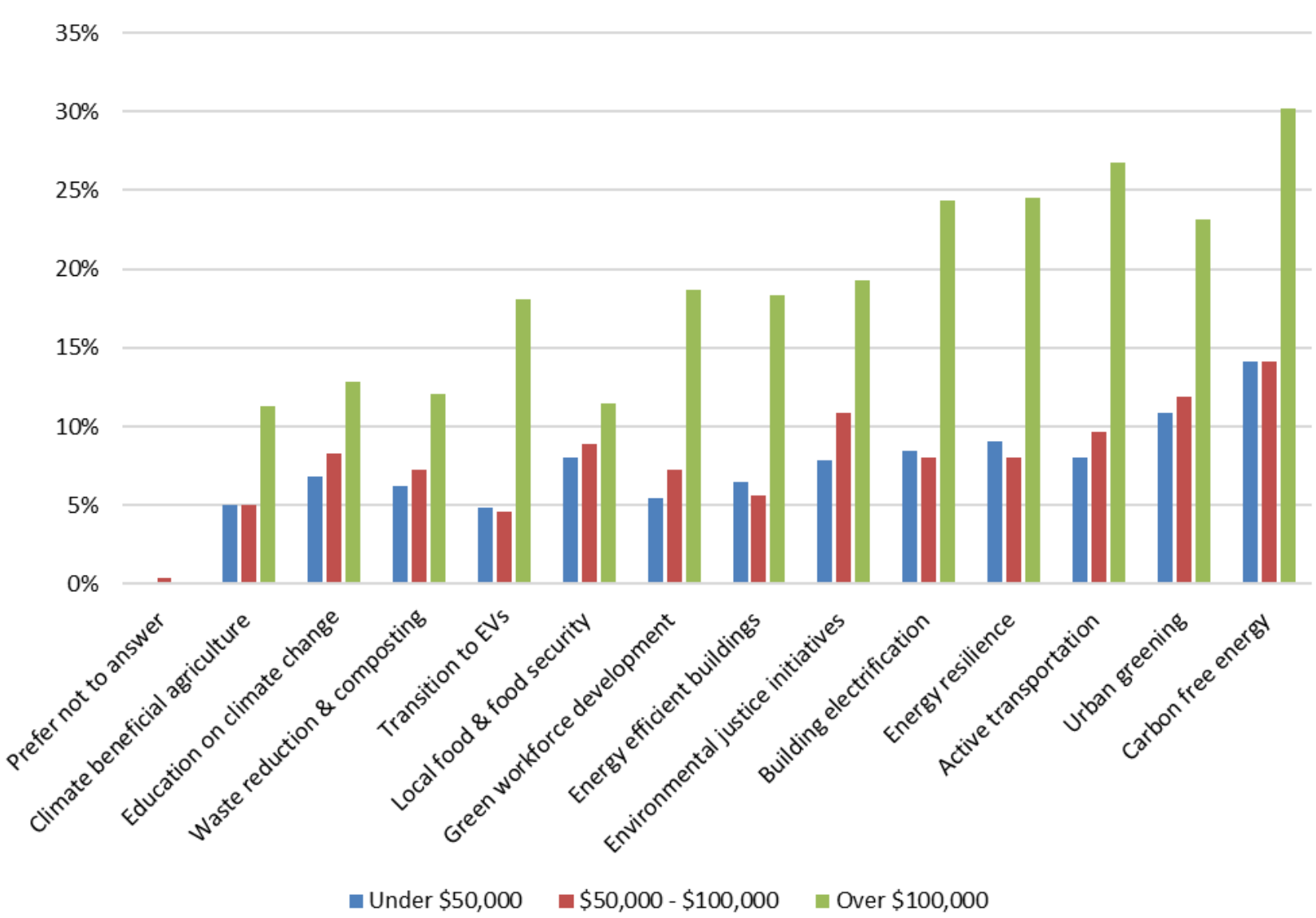


Figure E-10 Top Strategies for Climate Action - Income Results (BARCAP Survey)

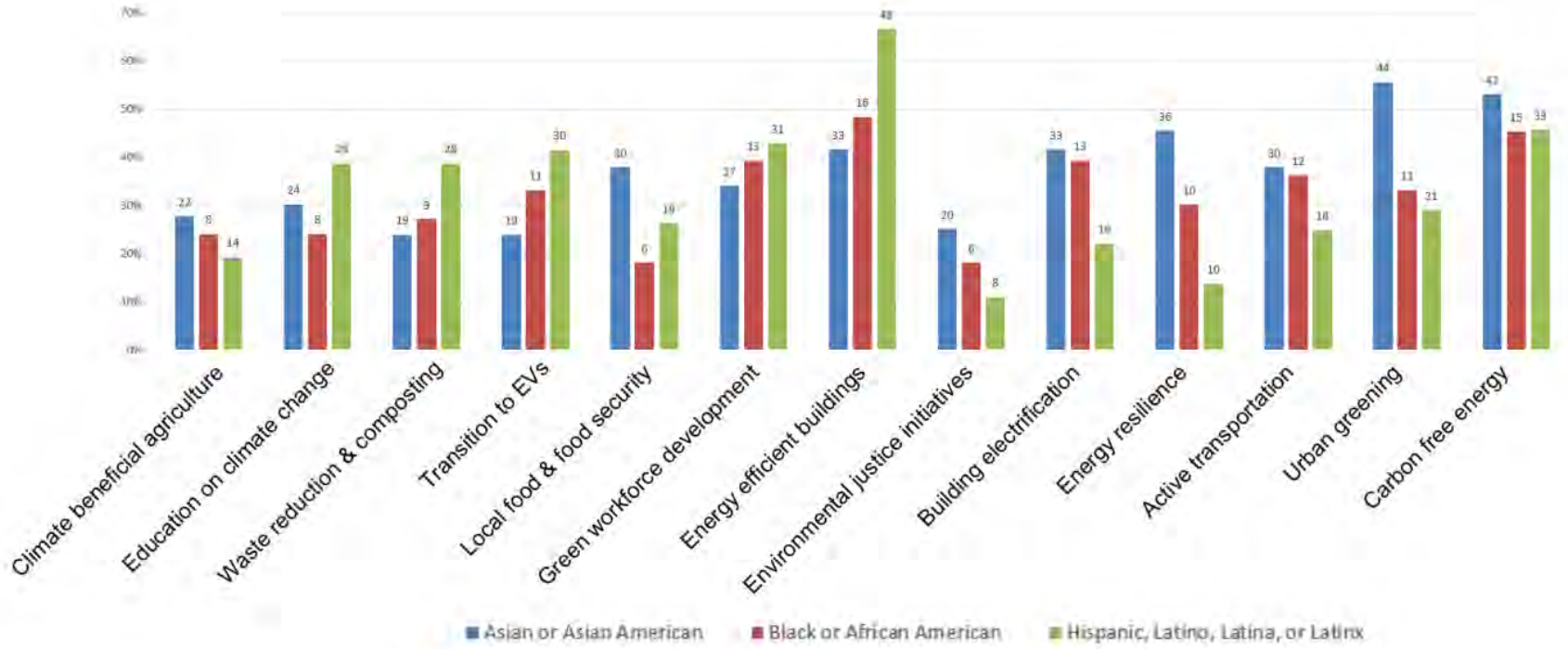


Figure E-11 Top Strategies for Climate Action - Race/ Ethnicity Results

Survey responses organized by race/ethnicity categories showed that support for top five climate actions had not-insignificant differences across Asian or Asian American, Black of African American, and Hispanic, Latino/a/x respondents.[3] The strategies with the most varied support were:

- "Transition buildings away from using natural gas to all-electric" received 46% support from Asian or Asian American respondents compared to 30% support from Black or African American respondents and 14% support from Hispanic, Latino, Latina, or Latinx respondents, and 45% support from white/Caucasian respondents.
- "Shift from driving an automobile to alternative transportation modes (walking, bicycling, transit)" received 56% support from Asian or Asian American respondents compared to 33% support from Black or African American respondents and 29% support from Hispanic, Latino, Latina, or Latinx respondents, and 45% support from white/Caucasian respondents.
- "Expand and protect green spaces, urban trees, and natural ecosystems" received 67% support from Hispanic, Latino, Latina, or Latinx respondents compared to 48% support from Black or African American respondents and 42% support from Asian or Asian American respondents and 47% support from white/Caucasian respondents.

Survey findings were used in addition to public workshop and frontline community feedback to update BARCAP measures before they were formally drafted.

E.5.4 Online Commenting Platform

Once draft measures were developed, the Air District launched a one-month public review and comment process, utilizing an interactive online platform. Through this platform, the general public was able to review all the draft measures and provide comments. The plan was made available in English, Spanish, and Traditional Chinese to increase accessibility and ensure non-English proficient individuals had the opportunity to provide feedback. The comment period was open between July 2nd and July 29th, 2025, and a total of 396 comments (387 in English and 9 in Spanish) from 65 individuals were received through the online platform.

The consultant project team, with assistance from the Air District, conducted outreach to frontline community workshop participants, partner CBOs, and AWG members serving multilingual communities to notify them that in-language options to public comment were available. Conducting this follow-on engagement was important for transparency to show

[3] Over 60% of respondents reported that they are white or Caucasian. The racial/ethnic groups that was chosen most often after White or Caucasian were Asian or Asian American (14%) and Hispanic, Latino, Latina, or Latinx (12%). Around 6% of respondents reported they were Black or African. Very few respondents reported they were Native American, American Indian, or Alaskan Native (3%) or Middle Eastern, North African, or Arab American (3%) or multiracial (3%). Less than 1% of respondents reported they were Native Hawaiian or other Pacific Islander. There was an over-representation of White or Caucasian survey respondents compared to the racial demographics of Bay Area counties. Per 2020 U.S. Census data, White or Caucasian people make up only 36% of the population in the nine-county area, but made up over 60% of survey respondents who identified their race (The San Francisco Foundation, PolicyLink, and USC Equity Research Institute, 2025). Asian or Asian Americans and Hispanic/Latino/Latina/Latinx peoples, who respectively make up an estimated 28% and 24% of the Bay Area's population, were under-represented.

workshop participants how their previous feedback was used, and to provide them additional opportunities to contribute to draft measures.

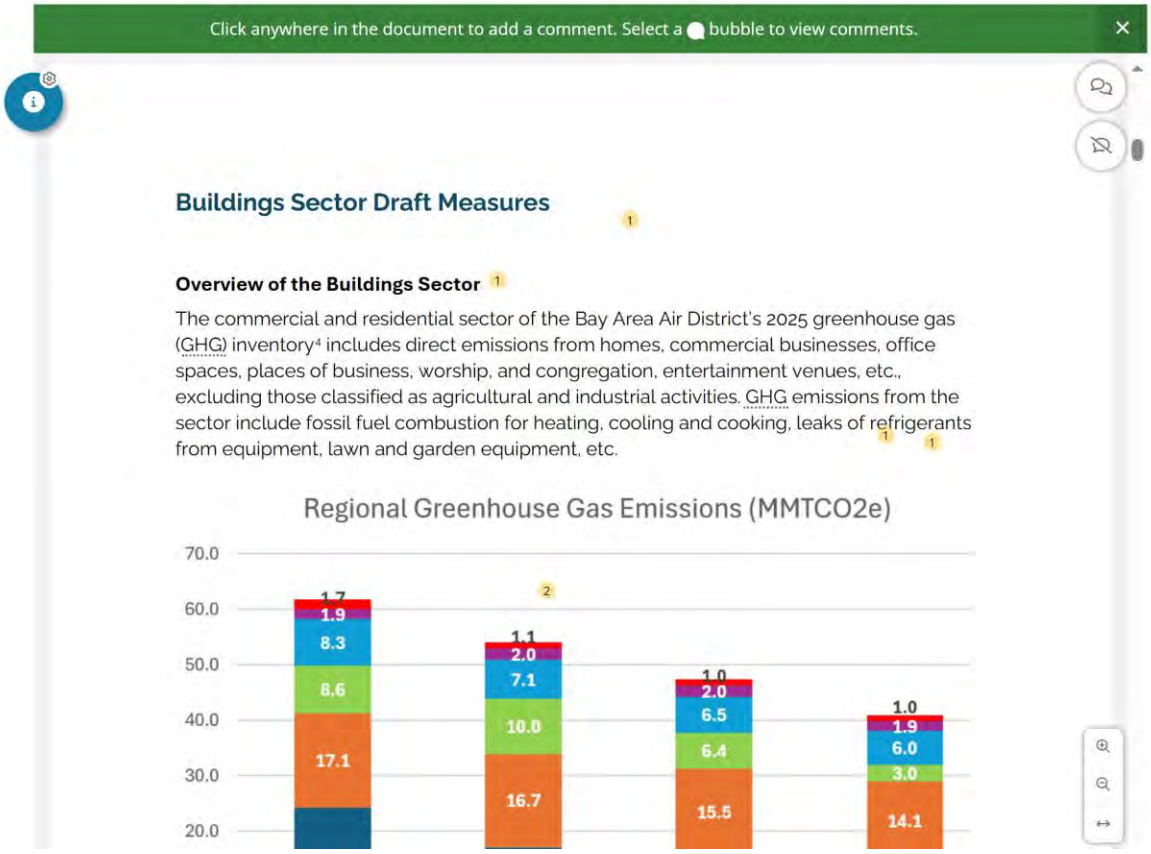


Figure E-12 Online Viewing and Commenting Platform

Respondents were able to add comments, as seen by the yellow comment bubbles in Figure E-12, directly on the plan document. The online viewing and commenting platform allowed the public to leave comments without needing to reference a page number or section of the plan. In addition, the site allowed commenters to leave comments over time. Respondents would often come back to the document multiple times and leave comments over the span of hours or days. Commenters could also view, "like," and respond to other comments, reducing duplication and allowing multiple individuals to engage on a single topic. The online platform made it easy for individuals to provide comments without having to write and submit a formal comment letter.

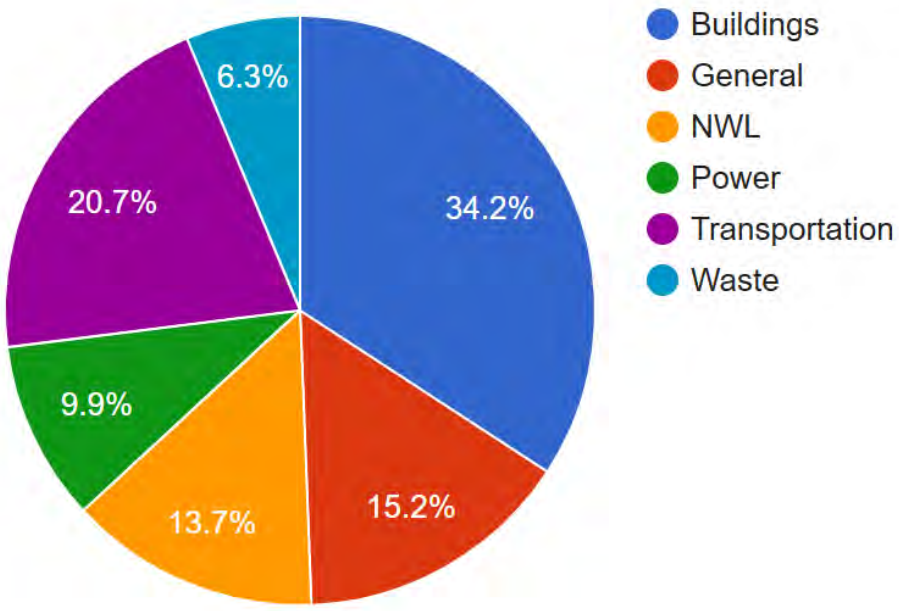


Figure E-13 Pie Chart of Public Comments by Sector

The buildings and transportation sectors received the most comments during the public comment period, accounting for 34% and 21% of the total comments, respectively. For each sector, a few high-level comment themes emerged. In the buildings sector, respondents highlighted affordability and installation challenges of building electrification, suggested additional partners for implementation, and stressed the need for equitable and expansive outreach and education on building electrification for contractors, businesses, homeowners, and renters. In the transportation sector, comments focused on EV charging accessibility challenges for renters and multifamily building residents, EV affordability, alternative fuels, VMT reduction, and concerns regarding airplane travel. Comments in the natural and working lands sector largely focused on centering equity and community engagement in planning green spaces, details for implementation, land use best practices, and the need to strengthen wildfire response. In the power sector, respondents commented on the need to enhance energy resilience and the importance of increasing the amount of local solar and storage. In the waste and materials management sector, comments focused on requiring best practice for sustainable materials in public works projects, creating public awareness and behavioral change around waste and composting, and suggesting implementation partners and resources.

E.5.5 Email Public Comments

The Air District also accepted comments via email. The Air District received 13 emails on the draft BARCAP measures from the public, community-based organizations, and governmental agencies. The organizations and agencies that commented include 350 Bay Area, Communities for a Better Environment, EarthJustice, Rocky Mountain Institute (RMI), Sierra Club, StopOAKExpansion, San Francisco Bay Regional Water Quality Control Board, and White Pony Express.

The Air District considered public comments from the public workshop, online commenting platform, and email when finalizing the BARCAP measures.

E.6 Technical Stakeholder Working Groups

The Air District assembled technical stakeholder working groups for each sector to help develop draft measure concepts. The Air District invited members to the technical stakeholder working groups based on subject matter expertise, their potential role as an implementation partner, and geographic diversity.

These working groups fostered broad-ranging conversations among practitioners that generated key insights and important perspectives to help shape measure development and implementation considerations. They supported the co-development of measures for each sector, basing them in on-the-ground realities and identifying areas to advance regional collaboration and leadership. They identified implementation hurdles and existing projects or programs to consider for scaling across the region, as well as unique opportunities for regional action that can only be achieved at the cross-county level. Follow-up meetings with potential assisting implementers were also scheduled throughout and after the working group meeting series on the recommendation of group members.

The working group process helped ensure that the measures aligned with BARCAP Design Principles, would lead to GHG reductions, achieve equity benefits, build on existing efforts, and were advantageous to implement at the regional scale. The working groups leveraged foundational desktop research conducted by the Air District. This research focused on assessing the existing policy, programmatic, and funding landscape for each sector (e.g., local climate action plans, the 2022 Scoping Plan, relevant state policies and programs), sectoral GHG emission profiles, key equity considerations, and potential sectoral focus areas to help begin identifying gaps and opportunities.

A sector-by-sector description of working group topics, members, and meeting topics is described below.

E.6.1 Buildings

Building Sector Technical Stakeholder Working Group members brought unique and important perspectives gained from direct experience in policy development and implementation, program administration, customer and workforce engagement, and owning and operating deed-restricted affordable housing. Smaller group meetings were also held to further discuss specific actions related to their existing work.

Organization	Organization Type
Association of Bay Area Governments/ Bay Area Regional Energy Network (ABAG/BayREN) (co-lead) (2 members)	Regional Government Agency
San Mateo County	Local Government
City and County of San Francisco	Local Government

Building Electrification Institute	Subject Matter Expert (building decarbonization policy and data)
Rebuilding Together	Community Based Organization
Three CCAs	Community Choice Aggregator
Contra Costa County	Local Government
Energy Solutions (for TECH Clean CA)	Program Administrator
Rebuilding Together	Community Based Organization
Tenderloin Neighborhood Development Corporation	Affordable Housing owner
Tre'Laine	Subject Matter Expert (workforce)
San Francisco Bay Area Planning and Urban Research Association (SPUR)	Community Based Organization
Building Electrification Institute	Subject Matter Expert (building decarbonization policy and data)
Building Electrification Institute	Subject Matter Expert (building decarbonization policy and data)

Table E-12 Building Sector Technical Stakeholder Working Group Members

The Building Sector Technical Stakeholder Working Group identified challenges and opportunities for regional action to address building emissions using policy, incentives, education, outreach and other available tools. Acknowledging the breadth and depth of innovative approaches already taking place in the Bay Area and throughout the state, members coalesced around the importance of the Air District's zero NOx Building Appliance Rules (9-4 and 9-6) as catalytic regulation that could significantly support shared goals to decarbonize the building stock while addressing critical regional air quality challenges. Additionally, the group considered ways to leverage previous work on Phase 1 of the BARCAP ("Priority Climate Action Plan") and proposed new actions which built on those concepts to address holistic retrofits of older homes in overburdened communities by combining home repairs with energy efficiency and electrification programs. Finally, the group emphasized the importance of growing the building decarbonization workforce by helping incumbent workers get the training they need on efficient electric appliances and ensuring disadvantaged and new workers have opportunities in this expanding market. The resulting measures and actions described in Chapter 7 - Buildings reflect these key areas: addressing implementation challenges with the zero NOx building appliance rules, supporting low-Income and frontline communities in achieving decarbonization and public health goals by integrating electrification home repair and non-energy programs, and providing resources and other support to expand, train, and diversity the building decarbonization workforce.

Building Sector Working Group Meeting Date	**Topics Covered**
October 18, 2024	• Introductions and BARCAP overview • Establish common understanding of sector scope and external input to date • Define success/roles and expectations

	• Group brainstorm on big ideas, priority focus areas, and needs and opportunities
December 9, 2024	• Provide example measure and action • Confirm priority measure areas and discuss prioritization criteria • Apply prioritization criteria and revise draft actions
January 8, 2025	• In depth discussion on key draft measures and actions: zero NO_x Building Appliance Rule implementation, enhancing existing program integration and delivery, and workforce
March 18, 2025	• Share and gather input on revised and updated measures • Discuss possible implementation roles
April 15, 2025	• Share revised and updated measures and gather input on timing, funding estimates and metrics • Clarify timeline for BARCAP development and additional opportunities for review and input from Buildings Sector Technical Stakeholder Working Group

Table E-13 1Building Sector Meetings & Topics Covered

E.6.2 Natural and Working Lands

Natural and Working Lands Technical Stakeholder Working Group members were selected with special attention paid to unique agriculture and land management types found throughout the region (e.g. viticulture and wetlands).

Organization	Organization Type
Metropolitan Transportation Commission (MTC) / San Francico Estuary Partnership	Regional Government Agency
Bay Area Regional Collaborative	Regional Government Agency
Solano Resource Conservation District	Special District
MTC (2 members)	Regional Government Agency
Contra Costa Resource Conservation District	Special District
Bay Area Air District	Regional Government Agency
San Mateo Resource Conservation District	Special District
Marin Resource Conservation District	Special District
City and County of San Francisco	Local Government
Napa Firewise	Community Based Organization
Bay Area Regional Collaborative	Regional Government Agency
StopWaste	Local Government
Sustainable Winegrowing Alliance	Community Based Organization
MTC / San Francisco Estuary Partnership	Regional Government Agency
Friends of the Urban Forest	Community Based Organization
Sonoma County Agricultural Preservation and Open Space District (Sonoma Ag+ Open Space)	Local Government
TOGETHER Bay Area	Nonprofit Organization
Carbon Cycle Institute	Nonprofit Organization

Table E-142 Natural and Working Lands Technical Stakeholder Working Group Members

The following organizations were consulted on an ad-hoc basis on the recommendation of the natural and working lands group.

Organization	Organization Type
San Francisco Estuary Institute	Nonprofit
San Francisco Bay Water Quality Control Board	Regional Government Agency
Gold Ridge Resource Conservation District	Special District
University of California Cooperative Extension	Academic Institution
Marin Water	Publicly Owned Water Utility

Table E-15 Additional NWL Meetings

The Natural and Working Lands (NWL) Technical Stakeholder working Group identified key hurdles faced by implementers and opportunities for regional action, as well as key subject matter areas for NWL that offered the greatest opportunities to protect carbon stocks and/or enhance carbon sequestration. They also provided perspectives on key equity challenges encountered in their work, funding and technical gaps, and an assessment of key assets and strengths in advancing nature-based solutions. The resulting measures and actions described in Chapter 10 - Natural and Working Lands reflect these key areas: regional funding and data support for nature-based solutions, protecting and enhancing carbon stocks with a particular focus on wildfire and wetlands, advancing climate-beneficial agriculture, and implementing urban greening with an equity focus, and investment in urban greening operations and maintenance.

Working group members acknowledged that the climate action category of NWL is extremely broad and combines many different areas of specific climate action that have unique technical and implementation considerations. Smaller group discussions were convened to dive into specific topics, including wetland, blue-carbon, and urban greening measures.

NWL Working Group Meeting Date	Topics Covered
October 31, 2024	• Kickoff meeting – full group • Project overview and working group role • Main areas for natural and working lands climate action
December 8, 2024	• Small-group – land protection and restoration • Key opportunities identified for BARCAP actions: Regional funding approaches, carbon rich nature of Bay Area wetlands, intersection of resilience, recreation and conservation.
December 16, 2024	• Small-group – scale up carbon farming • Key opportunities identified for BARCAP actions: Implementer-lead identification of infrastructure bottlenecks and opportunities to share resources, tools, and staff, opportunities to build on existing soil hub regional coordination
January 8, 2025	• Small-group – wildfire prevention

	• Key opportunities identified for BARCAP actions: Need to overcome hurdles to incentivize private landowners to manage wildfire fuels at scale, opportunity to leverage insurance mechanisms, funding gap to implement fuel management goals
February 20, 2025	• Draft measure review and carbon stock inventory presentation – full group • Brainstorm on draft measures, reflection of key equity issues throughout measures • Feedback on draft carbon stock inventory

Table E-16 Natural and Working Lands Sector Meetings & Topics Covered

E.6.3 Power

Power Sector Technical Stakeholder Working Group members brought unique and important perspectives gained from direct experience in renewable energy and storage procurement and load flexibility initiatives, customer programs and engagement, policy development and implementation, program administration, and efforts to bring affordable clean energy and storage plus load flexibility to low-income customers. Three community choice aggregators (CCAs) helped the Air District design meeting agendas and reviewed early iterations of the specific focus areas, informational documents, and measure concepts. A CCA also co-facilitated several meetings.

Organization	Organization Type
Four CCAs	Community Choice Aggregator (CCA)
GRID Alternatives	Community Based Organization
San Mateo County	Local Government
Two Municipal Utilities	Municipal Utility
GRID Alternatives	Community Based Organization
City of Hayward (2 members)	Local Government
Investor-Owned Utility	Investor-Owned Utility
Contra Costa County	Local Government
Zero Net Energy Alliance	Subject Matter Expert

Table E-17 Power Sector Technical Stakeholder Working Group Members

The Air District also consulted PSE Healthy Energy about clean resilient power for resilience centers and critical facilities, and developers of community solar and small solar photovoltaic and/or storage projects to understand their perspective on what incentivizes project development in the region. They also spoke with staff at the California Energy Commission (CEC) to understand existing demand flexibility approaches and pilots (including virtual power plants) and their potential for scalability.

The Power Sector Technical Stakeholder Working Group identified key needs and challenges for equitably deploying clean energy generation and storage and a more flexible grid in the region and opportunities for regional action and coordination to offer solutions and accelerate progress. Members recommended prioritizing equitable access to clean energy and storage,

affordability, funding/financing, and reliability and resilience. Several considerations raised by the Air District and the working group shaped the focus of measure development for this sector. Per state law, the Air District is prohibited from regulating CO_2 emissions from power plants and cogeneration facilities that are covered by the state's Cap-and-Trade program, which includes almost all CO_2 emissions from this sector. Many local climate action plans include actions to encourage resident and business participation in CCAs and to opt for the 100% renewable power option provided by CCAs. Therefore, measures do not focus on power plants or cogeneration facilities or on increasing participation rates in 100% renewable power options at CCAs. Workgroup members shared that CCAs and utilities tend to purchase most new utility-scale renewable power and storage resources from outside the BARCAP region, considering availability, economics, and local goals on climate and carbon emissions. State clean energy policy is helping drive procurement decisions. They also shared that siting large-scale utility projects in the region (versus small- to medium-scale projects) may raise concerns by local governments and others over land that otherwise could be used to meet housing demand or other pressing concerns. Nevertheless, members highlighted the multiple benefits of local clean energy and storage projects and load flexibility for the region, including strengthened regional grid resilience and reduced reliance on centralized generation, long-distance transmission, and fossil-fuel-based back-up generators, lower energy bills (on-site or community solar projects) and downward pressure on rates, job creation potential, and faster integration of new clean energy power and storage resources.

The resulting measures and actions described in Chapter 8 - Power, reflect the hurdles, opportunities, and considerations in the following areas: increasing deployment of small- to medium-sized local clean energy and storage projects (including distributed energy resources and behind-the-meter projects) and expanding customer programs and deploying power system and grid technologies more widely for a more flexible, efficient, resilient, and affordable grid (including virtual power plants and resilient and clean back-up power).

TSWG Meeting Date	Topics Covered
October 23, 2024	• Introductions and BARCAP overview • Establish common understanding of sector scope and external input to date • Identify big ideas, needs and opportunities, and priority focus areas
December 11, 2024	• Discuss among CCAs and municipal utilities priority focus areas and what they would want to be doing if there was more regional coordination and regional planning • Identify which of these ideas is actionable today
January 8, 2025	• Define and agree on what success for measure development looks like • Discuss key results of interim small group meetings • Review and refine updated measure areas and actions • Discuss possible implementers
March 27, 2025	• Answer key questions on actions, determine direction of necessary edits • General agreement on revised measure language

	• Determine if something key is still missing • Identify potential implementation leads • Prioritize actions for inclusion in BARCAP using criteria

Table E-18 Power Sector Meetings and Topics Covered

E.6.4 Transportation

Transportation Sector Technical Stakeholder Working Group members represented a broad array of backgrounds in the transportation and land use areas, including members that work on both light-duty electrification and/or medium- and heavy-duty electrification.

Organization	Organization Type
Port of Oakland (2 members)	Local Government
Transform	Community Based Organization
MTC (2 members)	Regional Government Agency
Three CCAs	Community Choice Aggregator
Transportation Authority of Marin	Local Government
City of Berkeley	Local Government
Sonoma County Transit Authority	Local Government

Table E-19 Transportation Technical Stakeholder Working Group Members

Note that other organizations were consulted on an ad-hoc or one-on-one basis to better understand overlap of existing work relevant to transportation measures. These organizations advised in measure development and consultation in addition to the working group members listed above.

Organization	Organization Type
California Energy Commission	State Agency
San Francisco Environment	Local/County Government
San Francisco Municipal Transportation Agency	Local/County Government
Two CCAs	Community Choice Aggregator
Contra Costa County Public Works	County Government
Electric Vehicle Coordinating Council	Peer-to-peer forum
GRID Alternatives	Regional Organization

Table E-203 Additional Transportation Meetings

The Transportation Technical Stakeholder Working Group identified key hurdles faced by implementers and opportunities for regional action, as well as key areas for the transportation sector that offered the greatest opportunities to realize GHG emission reductions in the region. They also provided perspectives on equity challenges encountered in their work, funding and technical gaps, and an assessment of assets and strengths in transitioning away from fossil fuels. The resulting measures and actions described in Chapter 6 - Transportation Sector reflect these key areas: accelerating light-duty electric vehicle adoption, accelerating medium- and heavy-duty vehicle and equipment decarbonization, and accelerating decarbonization of goods movement.

The Transportation Sector Working Group members acknowledged that although there is a lot of work already being done to reduce fossil-fuel use in the sector at various levels of government, there ae still opportunities to accelerate this work through regional collaboration. Three main meetings were held to discuss actions for the sector followed by one-on-one meetings with individual members and other stakeholders to discuss specific actions that aligned with the stakeholder's work. Additional follow-up meetings with potential supporting implementers were scheduled after the working group meeting series.

TSWG Meeting Date	Topics Covered
October 31, 2024	• Introductions and BARCAP overview • Establish common understanding of sector scope and external input to date • Define and agree on what success for measure development looks like • Introduce and agree on boundaries/focusing factors for GHG reduction measures • Discuss and select key focus areas
January 9, 2025	• Clarify input and add to ideas • Share and clarify BARCAP criteria and process for measure prioritization • Begin to discuss implementation options (e.g., funding, agencies, infrastructure)
March 28, 2025	• Discuss draft measures and actions • Identify possible implementation partners • Discuss implementation timeframe

Table E-21 Transportation Sector Meetings & Topics Covered

E.6.5 Waste

Waste Sector Technical Stakeholder Working Group members represented county-level local government agencies playing key roles in implementing Senate Bill 1383 for organics waste reduction and key food recovery organization partners identified by those local government implementers.

Organization	Organization Type
San Francisco Environment	Local Government
Zero Waste Marin	Local Government
StopWaste (2 members)	Local Government
Fremont LEAF	Community Based Organization
White Pony Express	Community Based Organization
County of San Mateo (2 members)	Local Government
RecycleSmart (2 members)	Local Government
Zero Waste Sonoma (2 members)	Local Government
Second Harvest of Silicon Valley	Community Based Organization
Joint Ventures Silicon Valley	Nonprofit Organization
ExtraFood	Community Based Organization

Alameda County Community Food Bank	Community Based Organization

Table E-22 Waste Technical Stakeholder Working Group members

In addition to the Waste Technical Stakeholder Working Group focused on food and organics waste reduction, the waste sector measure on building materials leveraged existing networks including the Bay Area Deconstruction Working Group – a cross-sector convening of practitioners advancing building material reuse – and a meeting of local governments focused on embodied carbon policies for building materials across the Bay Area. Participants in the local government meeting are listed below.

Organization	Organization Type
City and County of San Francisco (2 members)	Local Government
City of Palo Alto	Local Government
Alameda County GSA (2 members)	Local Government
County of San Mateo	Local Government
County of Marin	Local Government
City of Union City	Local Government
City of Pleasanton	Local Government
City of Oakland	Local Government
US Green Building Council (USGBC)	Nonprofit Organization

Table E-23 Bay Area Deconstruction Working Group Meeting Participants

The Waste Sector Technical Stakeholder Working Group identified key hurdles to implementing SB 1383 including edible food recovery from large commercial generators, properly sorting organics waste into streams for commercial composting without contamination and creating markets for the use of compost. Input gathering on the food and organics measure began with one-on-one meetings to hear initial perspectives followed by two group meetings. The first meeting presented the common themes heard in the meetings, received additional ideas and feedback for refinement. The second meeting presented revised actions that were further refined by the working group. The primary obstacle identified was a lack of adequate funding infrastructure for food recovery operations. Actions to remove this obstacle are reflected in Chapter 9 - Waste and Materials' measure W-1 Enable Food Access and Clean Compost. This measure also reflects the working group's identified need to coordinate regionally on organics collection best practices and policies implemented at the county scale. Finally, the working group clarified that long-term systemic changes were needed to create a sustainable food system and added an action to continue to explore those bigger picture solutions.

The building materials measure W-2: Advance Low-Carbon Building Materials and Reuse leveraged findings from a four-part series of the Bay Area Deconstruction Working Group held between September – December 2024. The findings from this series included the need for infrastructure for salvaged buildings materials, which includes economic development for reuse market actors, engagement with industry to increase the practice of reuse, and inclusions of building materials in codes and other local and state government policies. These needs are

reflected in measure W-2's actions. The Bay Area Deconstruction Working Group focuses primarily on salvaging and reusing materials from existing buildings, but the strategies are translatable to other low-carbon building materials and practices. To round out the measure to include other materials such as low-carbon concrete and bio-based materials, the draft measure and actions received feedback from a group of local governments that meet to discuss embodied carbon in building materials. Additional meetings with key implementing counties were held to ensure that the actions were aligned with their planned direction.

TSWG Meeting Date	Topics Covered
November 19, 2024	Focus on food and organics • Introductions and BARCAP overview • Establish common understanding of sector scope and external input to date • Discuss where there is the most potential for regional/collective action
January 23, 2025	Focus on food and organics • Discuss draft measures and actions, checking if the measures are comprehensive and if the actions are realistic • Discuss possible implementation partners
February 7, 2025	Ad hoc meeting of local governments on embodied carbon in building materials • Discuss draft building material measure and actions: ask questions, provide suggestions for alternative wording, and identify if anything is missing • Identify potential implementation partners

Table E-24 Waste Sector Meetings & Topics Covered

Appendix F
Workforce Planning Analysis

March 2026

Bay Area Regional Climate Action Plan

[bw] RESEARCH PARTNERSHIP

MEMORANDUM

To **Bay Area Air District**

From **BW Research Partnership**

Date **January 26, 2026**

Re **BARCAP Workforce Analysis**

Introduction

This memorandum summarizes the workforce planning analysis conducted by BW Research Partnership in support of the Bay Area Air District's Comprehensive Climate Action Plan (CCAP): the Bay Area Regional Climate Action Plan (BARCAP). This memo:

- Identifies current employment in the Bay Area within each of five BARCAP sectors;
- Provides estimates of future workforce demand in all five sectors;
- Determines key occupations critical to achieving the goals outlined in the BARCAP measures;
- Presents training and education requirements that are critical to developing a strong workforce within these key occupations;
- Outlines the ecosystem of key stakeholders and initiatives currently happening in the region;
- Analyzes workforce opportunities for low-income and disadvantaged communities.

The workforce projections discussed throughout this memo were developed by identifying relevant research highlighting activities similar to the measures in the BARCAP. While these studies are often imperfect representations of the full range of BARCAP activities, they are inclusive of the respective measures, align with the scope of the activities to be conducted and the types of occupations to be created, and address both the challenges and opportunities involved in building a workforce capable of meeting BARCAP goals. Future analyses geared towards providing policymakers and training providers with detailed anticipated workforce estimates may consider utilizing novel, tailored economic impact models built on programmatic cost data or labor-intensity tools to more accurately forecast the quantitative needs for specific occupations. For more information about how the employment estimates were developed, please review the appendix section of this memo beginning on page 44.

The reports utilized for future workforce estimates also highlight specific occupations which will be vital to the successful deployment of the proposed BARCAP measures. Although these are not the only occupations that will be in-demand through these activities, the occupations listed are among those that appeared most frequently within existing literature and labor market data, and a sustained shortage of

these workers would hinder the success of the BARCAP measures. For the remainder of this memo, these occupations are referred to as "priority occupations."

The measures identified in the BARCAP provide opportunities for "high road" jobs that are well-paying, stable, and provide career pathways in growing climate and clean energy sectors.[1] Meeting the demand for these jobs with a supply of qualified and trained workers will require a commitment to partnership and investment in workforce development activities—including workforce development boards that carry out much of this work—all while providing work opportunities and pathways to individuals from all communities within the region.

As is highlighted in each sector's ecosystem section, there are many climate-related workforce initiatives already in existence throughout the BARCAP region. This means that new programs are unlikely to be needed. Instead, existing programs can be expanded, and best practices can be shared across local governments to meet workforce needs created through these BARCAP measures. Many of these programs reside within or are adjacent to each of the county's workforce development boards, though other parties involved in energy and climate—including utilities and community choice aggregators, climate tech manufacturers, educational institutions, and non-profits—have programs that can be replicated or scaled to support these workforce needs. Convening these stakeholders, sharing best practices, and coordinating funding are just a few ways that existing efforts can be synthesized for maximum impact throughout the region.

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Transportation Sector

Current and Future State of the Workforce

The transportation sector is both the Bay Area's largest source of greenhouse gas (GHG) emissions and one of its greatest opportunities for strategic transformation. Currently, the sector employs nearly 135,000 workers[2] in the BARCAP region and an estimated average of 33,000 additional workers[3] [4] are needed to work full-time from 2020 to 2045 to meet the broader climate goal of decarbonizing the transportation sector. These employment forecasts from the University of California's Institute of Transportation Studies are based on the complete decarbonization of the transportation sector by 2045 to zero-emission vehicles (ZEVs), which includes a rapid conversion to battery-electric vehicles (BEVs), plug-in hybrid vehicles (PHEVs), and hydrogen fuel cell vehicles (FCEVs). This conversion requires additional activities, like the installation of electric charging and hydrogen fueling station infrastructure throughout the state, as well as the generation and procurement of those resources (electricity and hydrogen). The scenario from the study is more aggressive than BARCAP measures T-1 and T-2 but covers similar activities.

Measure T-3, which includes policies to reduce GHG emissions from goods movement and delivery, may have some workforce impacts that are not fully accounted for in transportation fuel switching. Measure T-4, which aims to reduce passenger vehicle miles traveled through land use and greater use of transit, biking, and walking, will require additional buildout of infrastructure. Adjusting one statewide study[5] of a broader package of related transit measures to the BARCAP region suggests that nearly 15,600 workers could be sustained through the construction of additional non-passenger motor vehicle-related transportation infrastructure.[6]

Alongside a significant number of new workers, this transition will also introduce new technical challenges; while electric motors share some similarities with internal combustion engines (ICE), they differ in important ways that require additional training, specifically for safe handling of high-voltage electrical systems. Hybrid vehicles also add another layer of complexity. As the transportation sector evolves, many current workers will need to expand their expertise to include emerging technologies, such as Electricians upskilling their knowledge of vehicle charging infrastructure and battery systems. These new challenges reinforce the need for specialized training programs for technicians as well as first responders who can ensure safety in an increasingly electrified transportation system. The Bay Area California Jobs First Initiative is investing heavily in this space, identifying battery manufacturing as a priority sector for the region. This means job opportunities in battery research and development, design, and manufacturing are likely to increase in the coming years as economic development investments and strategies take effect.

Additionally, the widespread adoption of EVs is expected to reduce demand for routine maintenance services, as these vehicles require fewer oil changes and engine repairs than ICE vehicles,[7] highlighting potential workforce disruptions and the need for proactive planning to support displaced workers and assist them in transferring their skills to new clean transportation jobs. At the same time, changes to this sector will drive potential losses at refineries as demand for fossil fuels declines (see "Power Sector"). A 2023 report on the economic impacts of a refinery closure in the Bay Area found that former refinery workers typically earn lower wages at their new jobs once re-employed.[8] While opportunities for refinery workers may exist in other growing areas of the clean energy economy, these opportunities may be located elsewhere in or outside of the BARCAP region, may require upskilling or additional education on new technologies such as hydrogen, or may not appear in significant numbers immediately while funding and construction of these projects are finalized. An intentional focus on these displaced workers is essential to a just transition.

The Transportation Sector has a mixture of union and non-union employment. Drivers and service providers of municipal fleets are often members of unions and have job protections, though mechanics at private automotive repair shops for passenger vehicles likely do not have these same benefits and protections. This means that these workers—who may also be most exposed to job loss via the transition to electric vehicles—require additional attention from policymakers to pre-empt large shifts in employment.

Occupational Analysis

The sector's workforce spans sales, installation, and maintenance roles—Retail Salespersons who introduce consumers to EVs, Electricians and Electrical Installers and Repairers who install, maintain, and repair vehicle charging stations, and Automotive Service Technicians who maintain fleets. These occupations have a smaller concentration of workers in the region than in the overall nationwide economy, likely due to the presence of many different industries and sectors in the Bay Area's economy, but will be critical to ensuring reliable access to ZEVs and the infrastructure that supports them. Compensation across most of these roles exceeds the regional median,[9] with the Electricians and Electrical and Electronics Installers and Repairers in particular providing stable, living wages for a family of two working adults and two children.[10]

Table 1: BARCAP Region Transportation Sector Occupations

Occupation	Total Employment[11]	Employment Percent Change (2022-2032)[12]	Location Quotient[13]	Median Hourly Wage[14]
Retail Salespersons	51,398	-2.4	0.73	$20.86
Electricians	12,362	18.3	0.85	$45.90

Automotive Service Technicians and Mechanics	10,684	5.2	0.74	$36.06
Electrical and Electronics Installers and Repairers, Commercial and Industrial Equipment	812	0.0	0.76	$46.24

Workforce preparation across these roles varies; sales roles often only require limited formal training, while trades roles often require apprenticeships, licenses, and an associate's degree or certification. Together, these occupations ensure that consumers can purchase EVs, that the vehicles are safely maintained, and that charging infrastructure is accessible and reliable—all of these functions are essential to successfully meeting the region's transportation decarbonization goals. Thus, building a cohesive pipeline that can train all these diverse roles while expanding access to technical training and apprenticeships for trades roles will be essential for making the ZEV transition both practical and equitable.

Table 2: Transportation Sector Occupational Education & Training Analysis[15]

Occupation	Role Within Sector	Minimum Education Requirement	Minimum Training Requirement	State License Requirements	Other Common Credentials
Retail Salespersons	ZEV sales	High school diploma or equivalent	Up to one year OTJ training	N/A	Vehicle Salesperson License[16]
Electricians	ZEV charging installation	Post-secondary certificate	One to two years OTJ training; recognized apprenticeship	State Electrical Contractor License	N/A
Automotive Service Technicians and Mechanics	ZEV repair and maintenance	Post-secondary certificate	One to two years OTJ training; recognized apprenticeship	CA Bureau of Automotive Repair (BAR) approved certification program; Automotive Service Excellence (ASE) certification exam	N/A
Electrical and Electronics Installers and Repairers, Commercial	Repair and maintenance of ZEV charging software /equipment	Associate's degree	One to two years OTJ training; recognized apprenticeship	N/A	American Society for Testing and Materials (ASTM)

and Industrial Equipment					International certifications; Electronic Technicians Association (ETA); National Center for Construction Education and Research (NCCER) certifications

Ecosystem of Key Stakeholders and Programs

Many partners are already mobilizing resources to advance workforce development initiatives and projects aligned with BARCAP measures. In the transportation sector, regional agencies such as the Metropolitan Transportation Commission/Association of Bay Area Governments (MTC/ABAG) and local transportation and transit agencies play a central role in shaping long-term strategies in transportation electrification. Table 12 highlights some key organizations and initiatives providing or supporting workforce training. See the appendices to this document—Appendix B: Ecosystem of Initiatives Across BARCAP Sectors and Appendix D: References —for initiatives and efforts that apply to all five sectors and links to programs, respectively.

Table *3*: Bay Area Key Organizations and Initiatives in the Transportation Sector[17]

Organization / Initiative / Program	Description
High Road Clean Transportation Career Pathways - West Oakland Job Resource Center	Partnership supporting workforce pipelines into EVs, charging infrastructure, and clean transit
Zero Emission Bus University (ZEBU)	AC Transit's program training mechanics and operators in zero-emission bus technologies
CalTrans Workforce Development Branch	Provides pre-apprenticeship training and career pathways in transportation and construction for youth and adults to increase the participation of women, minorities, and other disadvantaged individuals in skilled crafts
Electric Vehicle Infrastructure Training Program (EVITP) - California Energy Commission	Provides certification training for electricians to install electric vehicle charging equipment required for state-funded infrastructure projects
California Transit Works! (CTW)	A statewide consortium uniting transit agencies, unions, and colleges to expand high-road transit workforce partnerships centered on equity, worker voice, and clean-energy transit solutions

Contra Costa Harnessing Change: Refinery Transition Partnership (CCRTP)	Brings together refinery workers and community stakeholders to plan for equitable economic transition as Contra Costa County shifts from oil refining to low-carbon industries
West Oakland Job Resource Center (WOJRC) Regional Transportation, Distribution and Logistics (TDL) Workforce Institute and Expansion	Expands pre-apprenticeship and training programs that prepare Oakland residents for clean, equitable jobs in transportation, distribution, and logistics sectors

Building Sector

Current and Future State of the Workforce

The building sector currently supports around 60,000 workers in the BARCAP region through various energy efficiency activities.[18] The region may require 260 additional workers to support the BARCAP building sector goals to install heat pump upgrades and displace NOx-emitting equipment through early replacement initiatives.[19] This forward-looking employment estimate is based on the projected workforce impacts of 100% electrification of California's existing and new buildings adjusted to the total share of equipment projected to be replaced through BARCAP measure B-1.

While the three building measures in the BARCAP do not align perfectly with the full scope of building retrofits identified in the *UCLA California Building Decarbonization Workforce Needs and Recommendations* report, the BARCAP measures are all necessary to achieve the California Air Resource Board's goal of carbon neutrality in the building sector by 2045 while ensuring that the path to carbon neutrality is equitable and particularly supportive of workers and those who live in frontline communities. The 2019 statewide report is based on 100% decarbonization of buildings and suggests that an additional 12,400 full-time jobs across California in electricity generation and distribution could be created by 2045.[20] This estimate is based on an assumption of full building decarbonization and does not reflect the more limited and specific measures outlined in the BARCAP. While it should be interpreted as an upper-bound estimate much greater in scope than the BARCAP measures, this demand for meeting California's decarbonization goals should be noted by policymakers for future planning purposes.

While the workforce estimates cited above are greater in magnitude than the workforce impacts likely to arise from the BARCAP measures alone, the BARCAP measures represent an important step towards achieving sector goals, and the occupations and skills needed remain the same. Additionally, the transition is expected to be largely additive in terms of workforce; while the natural gas workforce may decline over the long term, this shift to buildings that operate on renewable electricity is projected to occur over time, and new demand from the transition to electrification will outweigh potential losses in the near term. A substantial portion of the natural gas workforce already possesses transferable skills—such as familiarity with technical systems, engineering principles, and health and safety protocols—that position them well for emerging roles in building electrification; however, targeted upskilling will be necessary to align with the evolving demands of energy-efficient technologies. For example, while plumbers are typically trained to size, install, and maintain conventional natural gas water heaters, the growing adoption of heat pump water heaters introduces new technical requirements around proper installation, commissioning, and maintenance.[21] Trades workers will need to upskill in areas such as siting, electrical integration, refrigerant flow management, condensate plumbing, and utility coordination, building on their existing general trades knowledge.

Occupational Analysis

Five skilled trades occupations—Carpenters; Construction Laborers; Electricians; Plumbers, Pipefitters, and Steamfitters; and HVAC Mechanics and Installers—will be critical to this transition. Thousands of workers are already employed in these roles, and expanding this workforce is not only necessary for the BARCAP but also presents significant economic opportunity, as all five occupations offer wages above the regional median of $33.93 per hour,[22] providing a living wage[23] for single earners and sustaining income for families with two working adults and one child.[24]

Table 4: BARCAP Region Building Sector Occupations

Occupation	Total Employment[25]	Employment Percent Change (2022-2032)[26]	Location Quotient[27]	Median Hourly Wage[28]
Carpenters	19,303	10.6	1.19	$40.34
Construction Laborers	18,842	13.0	0.73	$36.07
Electricians	12,362	18.3	0.85	$45.90
Plumbers, Pipefitters, Steamfitters	8,057	11.7	0.91	$36.18
HVAC Mechanics and Installers	6,142	15.5	0.78	$37.65

The successful preparation of this workforce depends on robust pipelines that combine classroom instruction, on-the-job (OTJ) training, and industry-recognized credentials. While these roles do not necessitate a college degree, the technical and safety-sensitive nature of the work requires structured pathways of apprenticeship training and hands-on learning. While roles such as Construction Laborers are suitable for more entry-level workers and require fewer prerequisites, most trades—including Carpenters, Electricians, Plumbers, and HVAC Mechanics and Installers—often require more structured pathways through vocational education, registered apprenticeships, and state licensing.

Appropriate training and certification for workers within the building sector is crucial to ensuring that building retrofits and new construction are completed with high standards, safeguarding worker and occupant safety and comfort. The building retrofit marketplace is generally split between large-scale construction projects (i.e. commercial, multifamily, industrial, etc.) typically conducted by larger and primarily union-signatory employers, and the single-family market which is served by smaller contracting companies staffed by workers who may receive little or no training in safety or the latest energy-efficient technologies. Current pilot programs, such as one pilot program run by the City of Berkeley, focus on the aggregation of single-family home retrofits to make them more cost-efficient to implement and therefore more feasible for larger commercial contractors that may incorporate high road labor

standards and training requirements. The California Workforce Development Board funded a High Road Training Partnership for Building Decarbonization, which aims to improve residential building retrofit labor and training standards throughout the Bay Area.[29]

The ability to implement building sector actions will hinge on sustained investment in hands-on skill development in the trades. Aligning these pathways with emerging building technologies like electric heat pumps and removing barriers to participation will be pivotal to ensuring that the region has enough skilled professionals.

Table 5: Building Sector Occupational Education & Training Analysis[30]

Occupation	Role Within Sector	Minimum Education Requirement	Minimum Training Requirement	State License Requirement	Other Common Credentials
Carpenters	Construct/install wood structures and fixtures within building infrastructure	High school diploma or equivalent	Up to a year OTJ training; recognized apprenticeship	State Carpentry and Cabinet Contract License	N/A
Construction Laborers	Perform a wide range of construction tasks with a variety of materials on building infrastructure	High school diploma or equivalent	Up to one year OTJ training	N/A	Occupational Health and Safety Administration (OSHA)[31] certification typically required; specialized tasks may require additional certification; National Center for Construction Education and Research (NCCER)[32] certifications
Electricians	Install electrical systems within building infrastructure	Post-secondary certificate	One to two years OTJ training; recognized apprenticeship	State Electrical Contractor License	N/A
Plumbers, Pipefitters, Steamfitters[33]	Install water heating and piping systems within building infrastructure	Post-secondary certificate	One to two years OTJ training; recognized apprenticeship	C-36 Plumbing Contractor License (for Plumbers/ Pipefitters); C-4 Steamfitting Contractor License (for Steamfitters)	N/A

HVAC Mechanics and Installers	Install HVAC systems within building infrastructure	Post-secondary certificate	One to two years OTJ training; recognized apprenticeship	State HVAC Contractor License; EPA Section 608 certification[34]	North American Technician Excellence® (NATE) certification[35]

While most building decarbonization activities require knowledge and skills that many contractors already have (e.g. most employers noted that new or additional heat pump-related training was not necessary for their workers),[36] some key building decarbonization technologies still require increased familiarity among contractors. One example is heat pump water heaters, which require knowledge of both plumbing and electrical systems; workers with expertise in just one of these areas may not be comfortable with their installation and maintenance. Addressing these gaps and providing targeted training for these technologies will be critical for ensuring workforce readiness.

Ecosystem of Key Stakeholders and Programs

The Bay Area is home to a dynamic ecosystem of organizations and initiatives that are actively supporting the workforce needed to accelerate the building decarbonization transition. Numerous initiatives are already underway to equip current workers with new skills and create pathways for new entrants into the workforce. However, additional investment and collaboration will be essential to scale these efforts to meet BARCAP goals. Table 3 highlights some key organizations and initiatives. See appendices to this document—Appendix B: Ecosystem of Initiatives Across BARCAP Sectors and Appendix D: References — for initiatives and efforts that apply to all five sectors and links to programs, respectively.

Table 6: Bay Area Key Organizations and Initiatives in the Building Sector[37]

Organization / Initiative / Program	Description
Bay Area Regional Energy Network (BayREN)	Regional network that provides contractor training, education, and workforce forums to support energy efficiency; offer training courses[38] in solar PV and storage systems, heat pumps, HVAC systems, energy code permitting and compliance, zoning codes, and sustainable home real estate
California Heat Pump Partnership	As described in their 2025 Blueprint, the Partnership aims to form a Workforce Advisory Council and launch a comprehensive initiative to support technical training, contractor engagement, and potentially develop a contractor certification program
City of Berkeley's Just Transition Residential Electrification Pilot	Supports workforce training in home electrification with a focus on equity and just transition
California Energy Commission Training for Residential Energy Contractors (CA-TREC)	State-supported training to equip residential contractors with skills in building performance and energy efficiency

Construction Trades Workforce Initiative (CWTI)	Workforce pipeline program expanding access to apprenticeships and careers in the construction trades
Catalyzing Quality Careers in Building Decarbonization - Rising Sun Center for Opportunity	Workforce partnership advancing equitable access to high-quality jobs in building decarbonization fields
East Contra Costa Healthy Homes Collaborative - Richmond Community Foundation	Community-driven effort advancing electrification, housing justice, and high-road job creation for frontline Contra Costa residents
JobTrain	Nonprofit that provides training, life supports, and job placement services to help underserved community members build sustainable careers in high-demand fields
Bay Area E-Contractor Academy - Emerald Cities Collaborative	Multi-week workshop series for small, minority-/women-/veteran-owned contractors to build technical, business, and operational capacity in electrification, energy efficiency, renewable energy, and green retrofit construction
Opportunity Build - Rising Sun Center for Opportunity	Free 10–12 week pre-apprenticeship program offering classroom and hands-on construction training, plus a year of job placement and retention support
Climate Careers - Rising Sun Center for Opportunity	Paid work experience program where youth gain hands-on job skills while contributing to local climate action projects
Catalyzing Quality Careers in Building Decarbonization - Rising Sun Center for Opportunity	Trains low-income job seekers of color for equitable, high-road careers in building electrification and energy efficiency
High School Girls Construction Camp - Trades Women, Inc.	Introduces high school girls to construction careers through hands-on training, mentorship, and leadership development to increase women's participation in the trades
City Build - San Francisco Office of Economic and Workforce Development	Construction pre-apprenticeship offering technical training, certifications, and pathways into union apprenticeships for San Francisco residents
Workforce Development Services - Family & Child Empowerment Services (FACES)	Job readiness and placement program connecting San Franciscans with employment opportunities across diverse industries including construction and trades
SEI's Energize Careers	Helps underrepresented individuals access paid green trade experience and long-term employment in energy efficiency and electrification sectors
Installation Basics Training 200 (IBT 200) - GRID Alternatives	Solar installation and workforce training program preparing participants for immediate employment in the solar industry
NextGen Trades Academy - Lime Foundation	Pre-apprenticeship program helping youth gain construction trade skills and employment pathways without requiring college

Construction Industry Workforce Initiative	Targeted to young urban adults from lower-income households to provide career development opportunities in Construction, Real Estate Development, Architecture and Engineering, Civic Engagement, and Urban Design
Equal Representation in Construction Apprenticeship (ERiCA) Grant - Department of Industrial Relations	A statewide initiative expanding access to construction career pathways for women, nonbinary, and underrepresented individuals in construction
Bay Area High Road Training Partnerships	Prepares workers for careers in electrification and building decarbonization
MCE and SEI's Green Construction Job Seekers Program	MCE, in partnership with SEI,[39] offers individualized career coaching, resume and interview support, and paid placements with local energy contractors to help launch careers in green trades like HVAC, plumbing, and electrical
Silicon Valley Clean Energy Contractor Training	Offers eligible Santa Clara County contractors $500 for completing an online course on all-electric building practices, plus up to $5,000 annually for installing electric appliances and promoting electrification technologies
Career Technical Education Foundation	Connects students, educators, and employers to build career-connected learning programs that prepare youth for life after high school, investing in regional pathways, internships, and education-to-workforce transitions; partners with Sonoma Clean Power

Power Sector

Current and Future State of the Workforce

The power sector currently employs roughly 41,000 workers in the BARCAP region.[40] Statewide employment in the power sector is projected to grow by more than 1.6 million jobs by 2045,[41] driven by the deployment of large-scale renewables, storage, and distributed generation. This employment forecast is based on the estimated investment and workforce needed to fully decarbonize California by 2045, assuming full electrification of the economy and wide integration of optimized and distributed solar and storage, along with utility-scale generation. Within the BARCAP region, this translates to an estimated demand of around 74,500 total full-time equivalent (FTE) workers in the sector by 2045. This scenario, however, may be more aggressive than BARCAP measure P-1 depending on where the new generation and storage referenced in the study is sited. Measure P-2, which expands customer programs equitably, may drive additional employment among electricity providers as they roll out new programs and increase capacity of existing programs. Further new employment opportunities may result from P-2 actions to deploy more power system and grid technologies like clean back up power, demand flexibility solutions, grid enhancing technologies, etc.

Much of this growth will involve equipping existing workers with new skills—such as electricians gaining expertise in grid modernization technologies, the integration of distributed energy resources (including household battery storage) into virtual power plants, and installation of vehicle charging infrastructure and batteries. The ongoing operations and maintenance of these systems will also employ a growing workforce. These emerging areas represent a notable evolution of traditional roles, underscoring the need for continuous upskilling and adaptation, but not necessitating a drastic overhaul of existing training and educational programming.

Currently, the BARCAP region has several refineries that employ around 3,250 direct fossil fuel workers,[42] mostly within the petroleum refinery industry of Contra Costa County, where the petroleum industry has historically been critical to the economy, offering high-paying jobs to local workers. When including other sectors reliant on refineries (e.g., construction, transportation), approximately 18,000 workers support this industry.[43] Workers who are displaced by refinery closures will need comprehensive reskilling and upskilling programs to help them transition into the renewable energy sector.

The power sector tends to be heavily unionized, as trades workers within utilities tend to be union members. However, as distributed energy resources continue to make up a larger share of the sector, union representation may decline. Implementing labor standards within publicly funded projects may help ensure that job quality remains high within this sector.

Occupational Analysis

Critical occupations in this sector include Electrical, Electronic, and Electromechanical Equipment Assemblers, Except Coil Winders, Tapers, and Finishers; Electrical Engineers; Electrical Power-Line Installers and Repairers; Solar Photovoltaic Installers; Power Plant Operators; and Wind Turbine Service Technicians. These occupations together make up a small portion of the overall Bay Area workforce but expanding them will be critical to successful implementation of the BARCAP measures. Some of these occupations are less concentrated in the Bay Area region than the nationwide economy, likely due to the Bay Area's largely urban setting and multifaceted economy. However, specific clean energy roles, such as Solar Photovoltaic Installers and Wind Turbine Service Technicians, are forecasted to grow considerably in the region over the next decade.

Geothermal energy, which might play a role in the BARCAP measures, requires many different occupations across different phases. These include scientific roles (e.g., Geologists, Hydrologists, Environmental Scientists), engineering roles (e.g., Civil Engineers, Electrical Engineers, Environmental Engineers), drilling occupations (e.g., Derrick Operators, Roustabouts), construction occupations (e.g., Construction Laborers, Electricians, Carpenters), as well as Power Plant Operators to operate and monitor the geothermal plant itself. Workers in many of these occupations will be able to transfer their skills from other industries to geothermal projects.[44]

Electrical, Electronic, and Electromechanical Equipment Assemblers represent an important occupation in battery manufacturing in the region—along with Team Assemblers, Inspectors, Testers, Sorters, Samplers, and Weighers, and Laborers and Freight, Stock, and Material Movers, Hand—and will be central to the Jobs First Next-Generation Battery Innovation and Manufacturing Hub Activation Plan, which emphasizes building a skilled, equitable workforce to advance battery production and supply chains.[45] Strengthening training pipelines for these workers will help position the region for success in battery manufacturing.

Many of the priority occupations in the power sector not only pay wages above the regional median but are also considered "living wages" in the Bay Area for single adults with no children. Electrical Engineers, Electrical Power-Line Installers and Repairers, and Power Plant Operators also offer family-sustaining wages for households with one working adult and two children.[46] As with other sectors throughout this memo, wages and the broader quality of jobs are contingent upon several factors, including geography, seniority, and unionization. While unionization tends to be higher in some industries within the power sector—such as utilities—unionization is much lower in other industries, such as the installation of solar PV panels. While some projects—especially those subject to prevailing wages or project labor agreement stipulations—may have unionized workers installing panels, other projects like rooftop installations often rely on a mobile workforce that receives relatively lower pay and fewer benefits and often does not live in the regions where they build projects.[47]

Table 7: BARCAP Region Power Sector Occupations

Occupation	Total Employment[48]	Employment Percent Change (2022-2032)[49]	Location Quotient[50]	Median Hourly Wage[51]
Electrical, Electronic, and Electromechanical Equipment Assemblers, Except Coil Winders, Tapers, and Finishers	4,977	1.5	1.09	$27.16
Electrical Engineers	3,908	9.1	1.12	$79.63
Electrical Power-Line Installers and Repairers	1,091	6.4	0.47	$59.54
Solar Photovoltaic Installers	1,023	45.7	1.77	$34.60
Power Plant Operators	196	-13.0	0.35	$58.09
Wind Turbine Service Technicians	88	9.4	0.35	$42.83

The transition to renewable energy sources requires both an expanded and highly skilled workforce. Building out training pipelines in battery storage, solar, wind, geothermal, and grid technologies, expanding apprenticeships, and ensuring equitable access to these opportunities will be essential. Occupations including Electrical Equipment Assemblers, Electrical Power-Line Installers and Repairers, and Power Plant Operators offer feasible career entry points, requiring a high school diploma and on-the-job (OTJ) training or an apprenticeship.

Table 8: Power Sector Occupational Education & Training Analysis[52]

Occupation	Role Within Sector	Minimum Education Requirement	Minimum Training Requirement	State License Requirement	Other Common Credentials
Electrical, Electronic, and Electromechanical Equipment Assemblers, Except Coil Winders, Tapers, and Finishers	Assemble or modify battery storage system equipment	High school diploma or equivalent	Up to one year OTJ training	Depends on type of electrical work being performed	Electronic Technicians Association (ETA) International

Electrical Engineers	Develop electrical systems and infrastructure for power generation, transmission, distribution, and battery storage	Bachelor's degree	Several years OTJ training	N/A	National Council of Examiners for Engineering and Surveying (NCEES) electrical exam
Electrical Power-Line Installers and Repairers	Install and maintain power lines that transmit electricity	High school diploma or equivalent	Up to one year OTJ training; recognized apprenticeship	N/A	Electronic Technicians Association (ETA) International
Solar Photovoltaic Installers	Install solar panel systems	Post-secondary certificate	Up to one year OTJ training; recognized apprenticeship	State Solar Contractor License	ETA International; North American Board of Certified Energy Practitioners
Power Plant Operators	Operate and monitor equipment that generates electricity in power plants	High school diploma or equivalent	Up to one year OTJ training	N/A	American Public Power Association certifications; North American Electric Reliability Corporation certifications
Wind Turbine Service Technicians	Maintain and repair wind turbines for wind power	Post-secondary certificate	One to two years OTJ training; potential apprenticeship	N/A	ETA International; North American Board of Certified Energy Practitioners

Ecosystem of Key Stakeholders and Programs

There are a range of stakeholders in the region that can lead and play a role in workforce development within the power sector. These include retail electricity providers (such as PG&E, public utilities, and Community Choice Aggregators) and BayREN, the region's Renewable Energy Network. Table 9 highlights some key organizations and initiatives. See the appendices to this document—Appendix B: Ecosystem of Initiatives Across BARCAP Sectors and Appendix D: References —for initiatives and efforts that apply to all five sectors and links to programs, respectively.

Table 9: Bay Area Key Organizations and Initiatives in the Power Sector[53]

Organization / Initiative / Program	Description

PG&E PowerPathway	Utility-led pre-apprenticeship program preparing workers for skilled utility careers
Bay Area High-Road Manufacturing Initiative - Working Partnerships USA	Regional effort to build a sustainable, equitable manufacturing ecosystem focused on battery storage and renewable energy technologies; includes pilot projects to improve job quality, support high-road employer practices, and develop a green industrial campus in Contra Costa County
GRID Alternatives	Nonprofit offering hands-on solar installation training and workforce entry programs in renewable energy
California Community Choice Association (CalCCA)	Advances workforce opportunities in renewable energy procurement and local energy projects
San Francisco Public Utilities Commission (SFPUC) Apprenticeships and Work Experience Programs	Provides career opportunities and training to residents from local communities to earn a salary while learning the skills necessary for high demand careers
The Energy Skills Collaborative (TESC)	Increases participation in the advanced energy economy and workforce in communities where health and financial well-being are most impacted by environmental distress
Bay Area E-Contractor Academy - Emerald Cities Collaborative	Multi-week workshop series for small, minority-/women-/veteran-owned contractors to build technical, business, and operational capacity in electrification, energy efficiency, renewable energy, and green retrofit construction
Bay Area Regional Energy Network (BayREN)	Regional network that provides contractor training, education, and workforce forums to support energy efficiency; offer training courses[54] in solar PV and storage systems, heat pumps, HVAC systems, energy code permitting and compliance, zoning codes, and sustainable home real estate
SunWork Volunteer Training Program	Trains individuals in solar basics and safety, then engages them in hands-on solar installations with professional staff; provides first step towards career in this field
College of San Mateo Electrical Power Systems Certificate	Three-semester certificate training program developed with PG&E and other utilities to prepare students for high-wage technical careers in industries like energy, transportation, and manufacturing, with training in electronics and instrumentation calibration
Contra Costa Harnessing Change: Refinery Transition Partnership (CCRTP)	Brings together refinery workers and community stakeholders to plan for equitable economic transition as Contra Costa shifts from oil refining to low-carbon industries

Waste and Materials Sector

Current and Future State of the Workforce

The waste and materials workforce is fundamental to meeting California's waste diversion goals. Roughly 9,000 workers[55] are currently employed in the region's recycling, composting, and waste management fields. An additional 1,415 workers are employed in manufacturing jobs that are part of the supply chains relevant to materials management (glass, paper, metal, wood, etc.), such as consumer products and building materials manufacturing, and an additional 24,448 workers are employed in food processing jobs, which involves transforming agricultural products and surplus food into new products for intermediate or final consumption.[56] These workers will be essential in advancing the state's goals of waste diversion, recycling, and the circular materials economy, including actions like those detailed in Senate Bill (SB) 54 (2022).[57]

To achieve California's waste reduction goals, Bay Area employment is projected to add over 16,000 direct recycling-related jobs that are sustained on an annual basis.[58] [59] These forward-looking employment estimates are drawn from the "Putting California on the High Road: A Jobs and Climate Action Plan for 2030" report chapter on waste, highlighting the anticipated workforce impacts of food diversion and composting (BARCAP measures W-1), while the job impacts of methane reduction from waste management facilities (W-3) may be more diffuse. Much of the research around embodied carbon and low-carbon building materials (Measure W-2) does not capture workforce impacts, though some reports mention the need to upskill existing workers on new technologies and materials.[60] [61] This remains an area where more quantitative research could be conducted.

These projected job figures are rooted in California's expansion of recycling, composting, and related services, which create not only more jobs in the traditional waste removal field but also more science and data-driven work, such as tracking waste streams and managing records,[62] improving material recovery facility operations, and advancing innovative circular economy practices.[63] Importantly, this growth represents a new addition of jobs—expanding waste collection, recycling, and circular economies—primarily building on existing activities without displacing workers.

Occupational Analysis

Multiple core occupations will play a central role in anchoring green initiatives involved in discarding food, goods, and building materials in the region. Many of these occupations—including Operating Engineers; Heavy and Tractor-Trailer Truck Drivers; Shipping, Receiving, and Inventory Clerks, and Mobile Heavy Equipment Mechanics—have a smaller concentration of workers in the region than in the overall nationwide economy. Multiple priority occupations within the sector offer wages above the regional median and provide accessible entry points, often without requiring college degrees.

Table *10*: BARCAP Region Waste & Materials Sector Occupations

Occupation	Total Employment[64]	Employment Percent Change (2022-2032)[65]	Location Quotient[66]	Median Hourly Wage[67]
Heavy-Duty and Tractor-Trailer Truck Drivers	26,746	9.6	0.67	$31.48
Light-Duty Truck Drivers	20,310	10.8	1.05	$24.60
Shipping, Receiving, and Inventory Clerks	12.893	-7.5	0.83	$24.19
Operating Engineers and Other Construction Equipment Operators	6,321	8.0	0.72	$54.98
Mobile Heavy Equipment Mechanics, Except Engines	2,786	8.5	0.8	$44.21
Refuse and Recyclable Material Collectors	2,737	9.9	1.02	$34.89
Hazardous Materials Removal Workers	1,425	7.6	1.55	$30.13

Scaling this workforce will require sustained investment in training and credentialing, including commercial driver's licenses (CDL), OSHA certifications, and industry-recognized safety credentials. By equipping workers with the necessary skills to successfully perform these jobs, the region can expand waste diversion services, improve community health, and advance climate goals.

Table 11: Waste & Materials Sector Occupational Education & Training Analysis[68]

Occupation	Role Within Sector	Minimum Education Requirement	Minimum Training Requirement	State License Requirements	Other Common Credentials
Heavy-Duty and Tractor-Trailer Truck Drivers	Drive waste/garbage trucks	High school diploma or equivalent	Up to one year OTJ training; potential apprenticeship	Class A or B Commercial driver's license (CDL)	N/A
Light-Duty Truck Drivers	Transportation of recovered food locally	High school diploma or equivalent	Up to one year OTJ training	Class C driver's license, Potentially Class A or B commercial	N/A

				driver's license (CDL)	
Shipping, Receiving, and Inventory Clerks	Track food recovery inventory and manage intake/ distribution	High school diploma or equivalent	Up to one year OTJ training	N/A	N/A
Operating Engineers and Other Construction Equipment Operators	Operate machinery on landfill sites and operate machinery essential in the deconstruction and dismantlement of buildings	High school diploma or equivalent	Up to one year OTJ training; recognized apprenticeship	N/A	Forklift Operator certification; Certified Equipment Manager
Mobile Heavy Equipment Mechanics, Except Engines	Maintenance of landfill machinery	Post-secondary certificate	One to two years OTJ training; recognized apprenticeship	N/A	National Center for Construction Education and Research (NCCER)[69] certifications; International Union of Operating Engineers (IUOE) Heavy Construction Equipment Mechanic
Refuse and Recyclable Material Collectors	Collect organic waste and recyclables, frontline landfill diversion, and support diverting construction waste from landfills by collecting recyclable and reusable building materials	High school diploma or equivalent	Up to one year OTJ training	N/A	Solid Waste Association of America certifications
Hazardous Materials Removal Workers	Handle and dispose of materials that pose environmental risks and safely remove and dispose of toxic materials during	High school diploma or equivalent	One to two years OTJ training; potential apprenticeship	OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER)	N/A

	building deconstruction, enabling reuse of materials				

Ecosystem of Key Stakeholders and Programs

Many organizations and initiatives already exist in the Bay Area that relate to waste and materials management, including workforce training programs in recycling and composting. However, there is opportunity for the creation of more intentional occupation-specific training programs and sector partnerships to build out the most robust workforce possible. Table 15 highlights key initiatives within the sector. See the appendices to this document—Appendix B: Ecosystem of Initiatives Across BARCAP Sectors and Appendix D: References —for initiatives and efforts that apply to all five sectors and links to programs, respectively.

Table *12*: Bay Area Key Organizations and Initiatives in the Waste Sector[70]

Organization / Initiative / Program	Description
Regenerative Jobs Program - Greenbelt Alliance	Workforce program linking diversion, composting, and regenerative agriculture with green job training
Civicorps	Offers training and employment in recycling and zero-waste services alongside educational support
Conservation Corps North Bay	Engages members in recycling, composting, and land restoration work while providing workforce development
Local and Regional Agencies Leading Recycling and Resource Efficiency	Includes organizations like StopWaste,[71] which is Alameda County's agency that serves as the Bay Area's lead organization on recycling and resource/water efficiency
California Climate Action Corps (CCAC) Fellowship	Deploys fellows statewide to lead community climate-action projects in urban greening, waste recovery, and wildfire resilience while gaining professional skills and certifications
Community Composting for Green Spaces – California Alliance for Community Composting	Supports the creation and expansion of community-scale composting sites statewide, providing job training, local food access, and green-space improvements in underserved communities
Gardening and Composting Educator Training Program (Get Up!)	Training course in the Bay Area that teaches sustainable gardening, regenerative composting practices, and ecological justice

Natural and Working Lands Sector

Current and Future State of the Workforce

The natural and working lands (NWL) sector currently employs about 49,000 people[72] in the BARCAP region, supporting nature-based carbon sequestration, wildfire mitigation, and ecological and agricultural restoration efforts. An estimated 2,200 more workers[73] [74] will be required in 2045 to meet the region's goals, based on the regional portion of the projected statewide NWL employment to implement California Air Resources Board's (CARB) 2022 Scoping Plan.[75] The four NWL measures within the BARCAP generally reflect actions within CARB's 2022 Scoping Plan, including improvement, management, and restoration of agricultural and working lands, expanding urban green spaces, wildfire management, and improved data analytics for nature-based solutions. The workforce in this sector will be key to implementing nature- and land-based climate solutions, including wildfire management, climate-beneficial agriculture, and urban greening.

While there are few "novel" occupational roles in this space, a growing emphasis on measuring and quantifying carbon capture in soils and landscapes represents an important scientific frontier for the sector that will require workers to continually grow their knowledge base. In addition, policies such as California's Sustainable Groundwater Management Act (SGMA) create new opportunities to transform farmland into hubs of climate resilience and ecological restoration. This transition does not represent a wholesale loss of existing activities but rather an evolution of practices that modify some existing tasks for workers. Agricultural work will increasingly shift toward lower-carbon, climate beneficial farming methods, prioritizing soil health and reducing excess nitrogen and phosphate inputs, highlighting the need for a workforce capable of managing land in ways that align with changing policies, priorities, and technologies. Fire and fuel management will include prescribed burning, targeted grazing, and other emergent sustainable practices. Urban greening—which includes planning and maintaining new foliage and greenery in urban areas to provide shade, mitigate heat island effects, and improve air quality—also plays an important role within the BARCAP through NWL Measure 4.

Occupational Analysis

Key occupations in this sector include Tree Trimmers and Pruners (Arborists), Firefighters,[76] Conservation Scientists, Foresters, and Agricultural Engineers, among others. Workers in the NWL sector are integral to protecting ecosystems, managing land sustainably, and preparing the region for climate resilience, yet some of these occupations—Farmers, Ranchers, and Other Agricultural Managers; Foresters; and Forest Fire Inspectors and Prevention Specialists—remain somewhat scarce in the region, with lower-than-average concentrations of workers compared to nationally. While several factors may contribute to these lower concentrations, the Bay Area's predominantly urban landscape likely explains much of the disparity, as these professions tend to be more prevalent in rural regions across the country.

Arborists will remain a crucial resource in urban greening and tree maintenance; however, as local budgets tighten and consolidate, cities and counties may lack the staff to maintain existing green spaces. Contracting arborist and urban greening work across multiple cities and counties may induce cost savings efficiencies while distributing costs across multiple jurisdictions.[77]

Another critical part of the NWL workforce is workers involved in climate beneficial agriculture. Occupations that support this industry in California include Farmworkers and Laborers, Crop, Nursery, and Greenhouse; Farmworkers, Farm, Ranch, and Aquacultural Animals; Agricultural Equipment Operators; First-line Supervisors of Farming, Fishing, and Forestry Workers; Graders and Sorters, Agricultural Products; and Farm Equipment Mechanics and Service Technicians. These workers will all play a vital role in whole-farm Climate Smart Agriculture projects.[78]

Professional services industry workers that provide supportive services to the NWL efforts will also play an important role in BARCAP measures, such as Business Operations Specialists[79] and Urban and Regional Planners. These workers offer expert planning, design, analysis, research, and implementation for conservation and restoration projects, ensuring the success of such projects through science-based solutions and collaborative efforts.

Many occupations within the NWL sector provide wages above the regional median of $33.93/hour. Many of these occupations also offer "living wages" in the Bay Area for single adults with no children as well as family-sustaining for households with two working adults and two children,[80] reinforcing their potential to provide meaningful livelihood while advancing public good.

Table *13*: BARCAP Region Natural & Working Lands Sector Occupations

Occupation	Total Employment[81]	Employment Percent Change (2022-2032)[82]	Location Quotient[83]	Median Hourly Wage[84]
Farmworkers and Laborers Crop, Nursery, and Greenhouse	11,042	1.7	1.13	$21.84
Firefighters[85]	4,158	6.8	0.72	$56.68
Farmers, Ranchers, and Other Agricultural Managers	3,923	0.4	0.29	$57.91
Environmental Scientists and Specialists	2,079	9.7	1.37	$53.93
Tree Trimmers and Pruners	1,215	11.9	1.05	$36.98
Urban and Regional Planners[86]	1,135	8.1	1.46	$63.38

Forest and Conservation Technicians	889	2.9	1.47	$34.17
Conservation Scientists[87]	436	15.0	0.92	$47.12
Foresters	142	0.0	0.67	$56.61
Agricultural Engineers[88]	43	10.2	1.4	$54.25
Forest Fire Inspectors and Prevention Specialists	39	6.8	0.65	$58.02

Developing a prepared and capable NWL workforce requires targeted investment in education and applied training. Technical roles such as Farmers, Ranchers, and Other Agricultural Managers, Environmental Scientists and Specialists, Urban and Regional Planners, Conservation Scientists, Foresters, and Agricultural Engineers typically require a bachelor's degree and several years of field experience. Meanwhile, other roles, such as Farmworkers and Laborers Crop, Nursery, and Greenhouse and Tree Trimmers and Pruners, offer viable entry-level career pathways with on-the-job (OTJ) training and less education requirements. Integrating climate resilience into higher education, strengthening applied training opportunities that bridge classroom learning with real-world application, and building clear career ladders will help ensure the region has the expertise to restore ecosystems and safeguard communities.

Table *14*: Natural & Working Lands Sector Occupational Education & Training Analysis[89]

Occupation	Role Within Sector	Minimum Education Requirement	Minimum Training Requiremen	State License Requirements	Other Common Credentials
Farmworkers and Laborers Crop, Nursery, and Greenhouse	Cultivate crops, maintain green spaces, and implement conservation practices on working lands	Less than high school diploma	Few months OTJ training	N/A	N/A
Firefighters[90]	Protect natural lands from wildfire threats	High school diploma or equivalent	One to two years OTJ training	EMT Certification; Candidate Physical Ability Test (CPAT); specific requirements vary by department	N/A

Farmers, Ranchers, and Other Agricultural Managers	Manage regenerative farming, soil conservation, and agricultural practices	Bachelor's degree	Several years OTJ training	Farm Labor Contractor (FLC) license (depending on job circumstances)	Certified Rangeland Manager (CRM)[91]
Environmental Scientists and Specialists	Analyze environmental impacts and develop strategies to enhance ecosystem health across rural and urban landscapes	Bachelor's degree	Several years OTJ training	Registered Environmental Health Specialist (REHS)[92]	National Registry of Environmental Professionals certifications
Tree Trimmers and Pruners	Maintain green infrastructure and treat urban green spaces	Less than high school diploma	Up to a year OTJ training	N/A	International Society of Arboriculture (ISA)[93]
Urban and Regional Planners	Design land use strategies that integrate green spaces	Master's degree	Some potential OTJ training, but assumed workers already have the training	N/A	Certified Urban Planner[94] or Certified Planner[95]
Forest and Conservation Technicians	Assist in monitoring and maintaining natural resources and compile data on forest characteristics	High school diploma or equivalent or associate's degree	One to two years OTJ training	Certified Rangeland Manager (CRM)[96]	N/A
Conservation Scientists	Develop and oversee land management plans that protect natural resources	Bachelor's degree	Several years OTJ training	N/A	N/A
Foresters	Manage forested lands for conservation and wildfire prevention	Bachelor's degree	Several years OTJ training	Registered Professional Forester license[97]	N/A
Agricultural Engineers	Develop technical systems for sustainable farming and land use	Bachelor's degree	Several years OTJ training	Professional Engineer (PE) license[98]	N/A

Forest Fire Inspectors and Prevention Specialists	Assess fire hazards, reduce severity of fires, and maintain forest health and stability	High school diploma or equivalent	One to two years OTJ training	CA State Fire Training (SFT) certification program	N/A

Ecosystem of Key Stakeholders and Programs

Different counties and municipalities throughout the region may have different priorities within the NWL sector. Cities may prioritize urban greening, while counties with substantial rural and fire-prone terrain may prioritize fire risk mitigation activities. Both independent and collaborative efforts are important and will require different mechanisms. One example of local action is Sonoma County's designation as a "Climate Resiliency District," or CRD—the only county in the state to have such a designation.[99] The Sonoma CRD demonstrates how coordinated, cross-jurisdictional strategies can generate meaningful impacts, and the frameworks developed in one jurisdiction can be adapted and replicated elsewhere to extend the impact of these efforts across numerous communities. This model also reflects how the region can address funding gaps and identify steady revenue streams for climate-related projects that are specific to their particular needs.

Other initiatives involved in the NWL sector include training efforts for carbon farm planners and carbon farmers with increased agroecological knowledge. Resource Conservation Districts' (RCD) "Regional Carbon Farming Hubs" are working with university partners, state agencies, and other conservation organizations to expand carbon farming education and training; they have set a minimum target of 42 RCD-related staff trained annually. Other efforts occurring across the Bay Area are outlined below.

Table 6 highlights some key organizations and initiatives. See the appendices to this document—Appendix B: Ecosystem of Initiatives Across BARCAP Sectors and Appendix D: References —for initiatives and efforts that apply to all five sectors and links to programs, respectively.

Table *15*: Bay Area Key Organizations and Initiatives in the Natural & Working Lands Sector[100]

Organization / Initiative / Program	Description
Indigenous and Immigrant Farm Workers Building a Climate Resilience Workforce - North Bay Jobs with Justice	Trains farm workers in climate-smart agricultural practices and resilience strategies
Regenerative Jobs Program	Creates workforce opportunities in regenerative agriculture and sustainable land management
Civicorps	Provides training and paid work experience in land management for young adults
Friends of the Urban Forest	San Francisco nonprofit offering hands-on training in tree planting, urban forestry, and nursery management

Conservation Corps North Bay	Provides young adults with paid work in habitat restoration, wildfire fuel reduction, and environmental stewardship
Providing High-Road Jobs to Latin Women Serving Their Community - UpValley Family Centers of Napa County	Develops a worker cooperative for Latina *promotoras* in Napa County, who serve disadvantaged populations, including farmworkers, and act as frontline emergency and disaster response workers in climate-impacted communities
Agricultural Worker Training and Advancement with High Road Employers (Ag HiRE)	Creates a bilingual training pipeline for Spanish-speaking farmworkers to advance into higher-paying jobs
Bay Area Farmer-to-Farmer Training (BAFFT) - Agroecology Commons	A nine-month agroecology program offering hands-on small-farm production, food sovereignty, and environmental justice training across the Bay Area
Farmer Mobilization Apprenticeships and Mentorship – Agroecology Commons	Provides paid apprenticeships connecting BAFFT graduates with experienced agroecological farmers to deepen skills and foster food-sovereignty projects
California Conservation Corps Training and Workforce Development Program	Enrolls young adults in year-long service projects that deliver forest fuel reduction, habitat restoration, and energy-efficiency work while preparing them for green careers
Environmental Management Social Enterprise - Civicorps	Engages Bay Area individuals in paid critical conservation work that builds environmental stewardship and job readiness
California Climate Action Corps (CCAC) Fellowship	Deploys fellows statewide to lead community climate-action projects in urban greening, waste recovery, and wildfire resilience while gaining professional skills and certifications
California Water, Wastewater, and Energy Workforce Development Program - Municipal Utilities Association	Builds a diverse, equitable workforce pipeline for underrepresented populations to secure stable careers in California's water, wastewater, and public energy utilities sectors
CAL FIRE Training Centers	Four training centers across California with core learning spaces providing realistic operational environments
Las Positas College East Bay Regional Fire Academy	Training and education provider for careers as certified firefighters by a professional fire service agency
Chabot College Fire Technology Program	One of the longest running fire programs in the Bay Area; offers coursework leading to industry certifications
City College of San Francisco Fire Academy	Course eligible to CCSF students, taught under the certification of the California State Fire Marshal Office of State Fire Training
South Bay Fire Fighter 1 & 2 Academy	Operated by the South Bay Regional Public Safety Training Consortium, an accredited regional training program (ARTP) with state fire training (SFT)
Center for Land-Based Learning California Farm Academy	Registered apprenticeship combining paid on-the-job training and instruction to elevate farmworkers to farm or ranch manager roles

Farm and Land Steward Apprenticeship Program – San Francisco Zen Center	Seasonal apprenticeship for farm or land stewardship roles on the organic farm and gardens at Green Gulch
Alemany Farm Internships	Interns work alongside Alemany Farm managers growing food and maintaining the organic farm dedicated to food security and community education
Regenerative Agriculture Farm Training (RAFT) - California Native Garden Foundation (CNGF)	15-week course to teach students how to manage regenerative organic agriculture methods
University of California Cooperative Extension	Connects University of California research and expertise with local residents, offering programs in food and nutrition, youth development, gardening and pest management, and natural resources to improve community health, the environment, and local economy
California Resource Conservation Districts (RCDs)	Provides leadership in conserving natural resources, preserving wildlife and habitat, training land stewards, and supporting sustainable agriculture through education, outreach, technical assistance, and partnerships
Santa Rosa Junior College Sustainable Agriculture Program	Offers an Associate of Science degree and two certificates focused on organic farming, ecological land management, and direct marketing to prepare for careers in Sonoma County's agricultural sector

Frontline Communities

Employment demand created through BARCAP measures can also offer substantial opportunity for individuals from frontline communities. Over 1.9 million residents in the region live within areas identified as frontline communities. The labor force participation rates for both frontline and non-frontline communities are around 66%—although the unemployment rate for frontline communities is nearly two percentage points higher than non-frontline communities. Job seekers residing in these frontline communities may also require additional resources, such as childcare, transportation assistance, and other services to overcome the systemic barriers to participating in certification and training programs and secure high road employment.

Table *16*: Employment and Labor Force Data by Community

	Population	Employment	Unemployment Rate	Labor Force Participation Rate	Median Family Income
Non-Frontline	3,815,995	1,989,720	4.81%	66.36%	$160,548
Frontline	1,910,134	974,520	6.65%	66.39%	$112,046

Job Quality and Accessibility

Nearly three-quarters (19 of the 26) of the priority occupations highlighted throughout this workforce study do not require college degrees for entry into the field, and they also provide livable wages, which means that not only are these roles accessible for individuals in frontline communities who may not have a college degree, but these jobs also provide an entry point into sustainable pathways to greater wealth and income levels.

While these occupations are technically accessible based on educational requirements and provide higher quality given wages, this does not mean that people in frontline communities will be able to access these roles in the absence of additional policy or support. For example, job seekers from frontline communities may be aware of these opportunities, but may lack access to childcare, accessible last mile transit options, or have other barriers beyond education.

Many of the measures in the BARCAP identify these needs and provide support to address these challenges. Initiatives beyond the BARCAP, such as California Jobs First, also offer funding streams to improve access to these opportunities. However, additional funding and organizational structures to support these initiatives will be important to ensure job seekers in frontline communities have access to the employment opportunities generated through the BARCAP.

Community Engagement Workforce

In addition to the professional services, skilled trades, and other types of jobs that will be crucial to implementing the measures in the BARCAP, there is also an important community engagement component of the BARCAP measures that offers jobs beyond the priority occupations already listed. Many BARCAP measures involve engaging residents, business owners, and communities, and sharing information about new technologies and opportunities. These community engagement roles will also be crucial for informing and recruiting jobs seekers, empowering them to receive the necessary certification and training, and connecting them with relevant employment opportunities that the BARCAP presents, so that job seekers from frontline communities can have the opportunity of working to make their communities less polluted and more climate resilient while also securing employment in good-paying jobs.

Furthermore, many of the BARCAP measures identify engagement specifically with frontline communities. After decades of disinvestment and disenfranchisement, these communities may be skeptical of new opportunities or technologies, though having informed and trusted advisors within their own communities that encourage participation in these opportunities or technologies may help alleviate these concerns. Therefore, educating and training individuals to support building electrification programs or provide information on rebate programs and education opportunities or waste collection initiatives –while paying them living wages – will be a central component of successful implementation.

Table *17*: BARCAP Region Non-Profit and Community Organization Occupations

Occupation	Total Employment[101]	Employment Percent Change (2022-2032)[102]	Location Quotient[103]	Median Hourly Wage[104]
Social and Community Service Managers	5,478	15.7	1.4	$44.50
Community and Social Service Specialists	2,589	8.9	1.33	$33.02
Environmental Scientists and Specialists	2,079	9.7	1.37	$53.93

Many jobs exist within the community organization sector, and the ones highlighted in the table below are only a small sample of opportunities available to individuals. While some positions may prefer undergraduate or advanced degrees or more extensive experience, the field also offers numerous accessible entry points. Individuals can begin their careers through part-time roles, coordinator-level roles, or support and assistance roles that typically require less formal education and training yet still provide valuable experience and pathways for growth.

Table *18*: Non-Profit and Community Organization Occupational Education & Training Analysis

Occupation	Role Within Sector	Minimum Education Requirement	Minimum Training Requirements/Preferences
Social and Community Service Managers	Manage green initiative programs and coordinate food recovery programs/community environmental health outreach	Bachelor's degree	Several years OTJ training
Community and Social Service Specialists	Build relationships with local communities, educate on green initiatives, and mobilize participation in programs	Associate's or Bachelor's degree	Several years OTJ training
Environmental Scientists and Specialists	Work within non-profits to address disproportionate environmental burdens, advocate for policy change, and support community-led solutions	Bachelor's degree	Several years OTJ training

Recommendations and Strategies to Meet Workforce Needs

This section outlines a series of recommendations to help ensure that the BARCAP region can meet a range of workforce needs across the five sectors. While some solutions may be more applicable to certain sectors than others, the full suite of recommendations will help address workforce challenges across all five sectors.

1. **Coordinate across unions, community colleges, vocational and technical schools, private sector, workforce development boards, and non-profit training organizations.** Most sectors have at least a few training providers that provide clear examples of the types of curricula, training support, and connection to employer networks that are necessary to meet workforce needs and support job seekers within frontline communities. For example, in the building sector the partnership between the Rising Sun Center for Opportunity and local trade unions provides a strong pipeline that encompasses everything from community outreach and engagement of job seekers within priority populations, training on modern technologies and support services along the way, and eventual connection and integration into the high road workforce through labor unions. AC Transit's Zero Emission Bus University program in partnership with Chabot College is another great example found within the transportation sector. Other sectors could benefit from identifying similar programmatic champions, implementing these systems throughout the Bay Area, and ensuring that training is accessible to priority populations.

2. **Increase communication and awareness of BARCAP careers within K-16 education.** A program that helps teach students about the in-demand careers outlined in the BARCAP and anticipated wages could help raise awareness of opportunities, guide students towards relevant coursework, and get them started early on career paths. The BARCAP can serve as a foundational document that demonstrates the wide range of initiatives already underway that promote job security and introduce job seekers to potential employers and training programs.

3. **Encourage and facilitate sustained and consistent funding for workforce development, which is a core component to perpetuating the activities of the BARCAP.** While there are some existing funding streams and initiatives that can be leveraged, a more consistent pool of funds could help support job creation and the training to help frontline communities secure those jobs. Regional coordination of funding, whether that be pooling of funds or 'earmarked' amounts within local agencies that fund similar 'archetypical' programs, could be one opportunity here. Sonoma County's classification as a Climate Resiliency District may also be a new avenue to raise and

utilize funds that are specifically geared towards addressing climate-related challenges, including the necessary workforce.

4. **Incentive program administrators can lead the way on encouraging job quality.** Existing job quality within a sector is driven primarily by market dynamics—how much cost will the market bear and what benefits does it perceive with greater job quality? The buildings sector is a great example of this phenomenon, where large scale projects often utilize unionized labor forces because those employers have access to a very large pool of highly trained and skilled talent, ensuring that job sites can scale quickly, are safer for workers, and result in high quality construction. However, smaller scale projects, such as those within single-family homes, often cannot bear the additional expense of such large and qualified teams. As a result, smaller scale employers or informal workers make up the majority of this market.[105] Local governments and agencies can intervene by requiring labor standards for publicly funded projects. Local agencies can also get inventive to circumvent some of these additional market factors. For example, the City of Berkeley's Just Transition Residential Electrification Pilot seeks to aggregate residential projects to make them more accessible and efficient for employers with high road employment practices. This system could work for other sectors, such as setting labor standards for waste processing centers or urban greening initiatives.

5. **Policymakers must continue to monitor the energy transition.** While most of the sectors within the BARCAP are likely to see additional employment needs without driving significant employment disruption, there are segments of the economy that will undergo change, and workers within these sectors may require assistance to transition to new roles. The region could start up an 'energy transition' working group that is responsible for tracking developments in technology and the workforce, proactively identifying areas where employment disruption may be occurring, and working with existing local workforce and economic development organizations to support workers facing disruption.

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[1] "California High-Road: A Road Map to Job Quality." UCLA Labor Center, (n.d.). https://cwdb.ca.gov/wp-content/uploads/sites/43/2020/08/OneSheet_Job-Quality_ACCESSIBLE.pdf

[2] "Workforce Impacts of Achieving Carbon-Neutral Transportation in California." UCLA Luskin Center for Innovation, 2022. https://innovation.luskin.ucla.edu/wp-content/uploads/2022/09/Workforce-Impacts-of-Achieving-Carbon-Neutral-Transportation-in-California.pdf

[3] "Driving California's Transportation Emissions to Zero." University of California Institute of Transportation Studies, 2021. https://escholarship.org/uc/item/3np3p2t0

[4] Includes direct, indirect, and induced workers. Estimate does not account for substantial decline in internal combustion engine vehicles (ICEVs) jobs or fossil fuel jobs between now and 2045.

[5] "Evaluating Benefits from Transportation Investments Aligned with the Climate Action Plan for Transportation Infrastructure (CAPTI)." San Jose State University Mineta Transportation Institute, 2023. https://transweb.sjsu.edu/sites/default/files/2227-Alexander-California-Climate-Action-Plan-Transportation-Infrastructure.pdf

[6] This employs a similar methodology to what was utilized in the Bay Area's Priority Climate Action Plan (https://www.baaqmd.gov/en/plans-and-climate/climate-planning/bay-area-regional-climate-action-planning-initiative/priority-climate-action-plan)

[7] "EVs Cost 40 Percent Less to Maintain Than Conventional Cars." Yale School of the Environment, 2021. https://e360.yale.edu/digest/energy-department-report-finds-that-evs-cost-40-percent-less-to-maintain-than-conventional-cars?

[8] "Fossil Fuel Layoff: The Economic and Employment Effects of a Refinery Closure on Workers in the Bay Area." UC Berkeley Labor Center, 2023. https://laborcenter.berkeley.edu/fossil-fuel-layoff/#:~:text=Targeted%2C%20individualized%20job%20search%20assistance,during%20layoffs%20and%20job%20transitions

[9] The "Retail Salespersons" occupational category spans many industries beyond automotive sales, and because most roles in those industries require limited training and are often part-time or seasonal, the overall median wage for the occupation skews lower than other more specific occupations identified in this memo.

[10] "Living Wage Calculation for San Francisco-Oakland-Berkeley, CA." MIT Living Wage Calculator, 2025. https://livingwage.mit.edu/metros/41860

[11] Data from JobsEQ. 2025Q1. Figures reflect total employment for each occupation across all industries and sectors, not limited to those directly associated with the BARCAP sector.

[12] Percent change in employment across the state of California. Data from Long-Term Occupational Employment Projections, California Open Data Portal (https://data.ca.gov/dataset/long-term-occupational-employment-projections/resource/274e273c-d18c-4d84-b8df-49b4d13c14ce)

[13] Location quotients (LQ) measure the concentration of an occupation in a local/regional area by comparing its share of employment to its share of national employment. An LQ greater than 1 means the occupation is more concentrated locally than nationally, while an LQ less than 1 indicates less concentration. Data from JobsEQ. 2025Q1.

[14] Data from JobsEQ. 2025Q1.

[15] O*NET OnLine, U.S. Department of Labor (https://www.onetonline.org/)

[16] Provided by CA Department of Motor Vehicles (DMV).

[17] This list is not exhaustive, and other key partners and funders in the space may be absent.

[18] "U.S. Energy and Employment Report." U.S. Department of Energy, 2024. https://www.energy.gov/media/330956

[19] "California Building Decarbonization Workforce Needs and Recommendations." UCLA Luskin Center for Innovation, 2019. https://innovation.luskin.ucla.edu/wp-content/uploads/2019/11/California_Building_Decarbonization.pdf

[20] "California Building Decarbonization Workforce Needs and Recommendations." UCLA Luskin Center for Innovation, 2019. https://innovation.luskin.ucla.edu/wp-content/uploads/2019/11/California_Building_Decarbonization.pdf

[21] "Identifying and Defining High Priority Commercial Building Energy Efficiency and Electrification Jobs and Skills for a Growing and Diverse Workforce." American Council for an Energy-Efficient Economy (ACEEE), 2024. https://www.aceee.org/sites/default/files/proceedings/ssb24/assets/attachments/20240722163107796_c092d835-2227-4c8b-8cd5-580adbb01746.pdf

[22] Data from JobsEQ. 2025Q1.

[23] The *federal poverty wage* reflects the minimum income needed to avoid poverty, but does not account for regional variations in cost of living or the actual expenses required to maintain a basic standard of living. For this analysis, we use the *living wage* designation to more accurately capture the income necessary for workers to meet essential needs, providing a more realistic benchmark for evaluating job quality.
[24] "Living Wage Calculation for San Francisco-Oakland-Berkeley, CA." MIT Living Wage Calculator, 2025. https://livingwage.mit.edu/metros/41860
[25] Data from JobsEQ. 2025Q1. Figure reflects total employment for each occupation across all industries and sectors, not limited to those directly associated with the BARCAP sector.
[26] Percent change in employment across the state of California. Data from Long-Term Occupational Employment Projections, California Open Data Portal (https://data.ca.gov/dataset/long-term-occupational-employment-projections/resource/274e273c-d18c-4d84-b8df-49b4d13c14ce)
[27] Location quotients (LQ) measure the concentration of an occupation in a local/regional area by comparing its share of employment to its share of national employment. An LQ greater than 1 means the occupation is more concentrated locally than nationally, while an LQ less than 1 indicates less concentration. Data from JobsEQ. 2025Q1.
[28] Data from JobsEQ. 2025Q1.
[29] "Bay Area Residential Building Decarb High Road Training Partnership Summary." Rising Sun Center for Opportunity, (n.d.). https://risingsunopp.org/wp-content/uploads/Rising-Sun-Bay-Area-Residential-Building-Decarb-HRTP-Summary.pdf
[30] O*NET OnLine, U.S. Department of Labor (https://www.onetonline.org/)
[31] OSHA certification verifies that a worker has completed training on workplace safety and health hazards.
[32] NCCER offers industry-recognized credentials across numerous skilled trades.
[33] Occupation defined in accordance with the nomenclature of the Standard Occupational Classification system used in federal labor statistics. Steamfitters may entail different job activities than Plumbers and Pipefitters in the building sector and may have different licensing and education requirements.
[34] EPA 608 certification is a federally mandated requirement for technicians who handle refrigerants in HVAC systems, ensuring compliance with environmental regulations.
[35] NATE certification is a nationally recognized credential for HVAC technicians that validates their skills in installing, maintaining, and troubleshooting HVAC systems.
[36] "Workforce Challenges for Zero Nox Requirements – Implementation Working Group Research." Bay Area Air District and BW Research, 2024. https://www.baaqmd.gov/~/media/files/community-health/building-appliance-implementation/workforce-summary-memo-pdf.pdf?rev=a8670756237f4fcdbc4e3b8603ff951b&sc_lang=en
[37] This list is not exhaustive, and other key partners and funders in the space may be absent.
[38] Events & Training, Bay Area Regional Energy Network. https://www.bayren.org/events-training?audience=All&type=Training&title=&protect_form_flood_control=protect_form_flood_control
[39] Energize Careers. https://www.energizecareers.org/participate.html
[40] "U.S. Energy and Employment Report." U.S. Department of Energy, 2024. https://www.energy.gov/media/330956
[41] "Role of Distributed Generation in Decarbonizing California by 2045." Vibrant Clean Energy, 2021. https://vibrantcleanenergy.com/wp-content/uploads/2021/07/VCE-CCSA_CA_Report.pdf#:~:text=The%20total%20full%20time%20equivalent,scale%20solar%20and%20storage%20by
[42] Quarterly Census of Employment and Wages (QCEW), California Open Data Portal. https://data.ca.gov/dataset/quarterly-census-of-employment-and-wages/resource/119eef38-3b59-499f-8f7c-9bea4768469d
[43] "Refining Transition: A Just Transition Economic Development Framework For Contra Costa County, California." UC Berkeley Labor Center, 2025.

[44] "Careers in Geothermal Energy." U.S. Bureau of Labor Statistics.
[45] "Next Generation Battery Innovation and Manufacturing Hub in the Bay Area: Activation Plan." Bay Area Jobs First Collaborative, 2025.
[46] "Living Wage Calculation for San Francisco-Oakland-Berkeley, CA." MIT Living Wage Calculator, 2025. https://livingwage.mit.edu/metros/41860
[47] "An Updated Review of the Solar PV Installation Workforce Literature" NREL 2023.
[48] Data from JobsEQ. 2025Q1. Figures reflect total employment for each occupation across all industries and sectors, not limited to those directly associated with the BARCAP sector.
[49] Percent change in employment across the state of California. Data from Long-Term Occupational Employment Projections, California Open Data Portal (https://data.ca.gov/dataset/long-term-occupational-employment-projections/resource/274e273c-d18c-4d84-b8df-49b4d13c14ce)
[50] Location quotients (LQ) measure the concentration of an occupation in a local/regional area by comparing its share of employment to its share of national employment. An LQ greater than 1 means the occupation is more concentrated locally than nationally, while an LQ less than 1 indicates less concentration. Data from JobsEQ. 2025Q1.
[51] Data from JobsEQ. 2025Q1.
[52] O*NET OnLine, U.S. Department of Labor (https://www.onetonline.org/)
[53] This list is not exhaustive, and other key partners and funders in the space may be absent.
[54] Events & Training, Bay Area Regional Energy Network. https://www.bayren.org/events-training?audience=All&type=Training&title=&protect_form_flood_control=protect_form_flood_control
[55] Occupational Employment and Wage Statistics (OEWS), U.S. Bureau of Labor Statistics. https://www.bls.gov/oes/
[56] Quarterly Census of Employment and Wages (QCEW), California Open Data Portal. https://data.ca.gov/dataset/quarterly-census-of-employment-and-wages/resource/119eef38-3b59-499f-8f7c-9bea4768469d
[57] "SB 54 Statewide Needs Assessment." CalRecycle, (n.d.). https://calrecycle.ca.gov/packaging/packaging-epr/needs-assessment/
[58] "Putting California on the High Road: A Jobs and Climate Action Plan for 2030." UC Berkeley Labor Center, 2020. https://laborcenter.berkeley.edu/wp-content/uploads/2020/08/Chapter-9-Waste-Sector-Putting-California-on-the-High-Road.pdf
[59] Estimate does not include indirect employment in equipment supply chains or manufacturing with recycled inputs, nor do they account for induced jobs created by the spending of newly employed workers. As a result, the full economic impact of this sector is likely greater than stated.
[60] "Embodied Carbon Reduction Roadmap." ARUP and Natural Resources Defense Council (NRDC), 2023. https://www.arup.com/en-us/insights/embodied-carbon-reduction-roadmap/
[61] "Reducing Embodied Carbon in Buildings." RMI, 2021. https://rmi.org/insight/reducing-embodied-carbon-in-buildings/
[62] California's SB 1383 requires entities to collect, maintain, and report data on waste stream tracking and contamination monitoring for compliance purposes, creating potential for jobs in data management and compliance. https://calrecycle.ca.gov/organics/slcp/recordkeeping/
[63] "Jobs and Skills in the Circular Economy: State of Play and Future Pathways." Circle Economy, 2020. https://cdn.prod.website-files.com/5d26d80e8836af2d12ed1269/5e6897dafe8092a5a678a16e_202003010%20-%20J%26S%20in%20the%20circular%20economy%20report%20-%20297x210.pdf
[64] Data from JobsEQ. 2025Q1. Figures reflect total employment for each occupation across all industries and sectors, not limited to those directly associated with the BARCAP sector.

[65] Percent change in employment across the state of California. Data from Long-Term Occupational Employment Projections, California Open Data Portal (https://data.ca.gov/dataset/long-term-occupational-employment-projections/resource/274e273c-d18c-4d84-b8df-49b4d13c14ce)
[66] Location quotients (LQ) measure the concentration of an occupation in a local/regional area by comparing its share of employment to its share of national employment. An LQ greater than 1 means the occupation is more concentrated locally than nationally, while an LQ less than 1 indicates less concentration. Data from JobsEQ. 2025Q1.
[67] Data from JobsEQ. 2025Q1.
[68] O*NET OnLine, U.S. Department of Labor (https://www.onetonline.org/)
[69] NCCER offers industry-recognized credentials across numerous skilled trades.
[70] This list is not exhaustive, and other key partners and funders in the space may be absent.
[71] StopWaste. https://www.stopwaste.org/
[72] Employment estimates for this sector were derived using California Open Data Portal's Quarterly Census of Employment and Wages (QCEW) data aligned with relevant NWL NAICS codes. These codes were selected based on the BARCAP definition of the NWL sector and informed by desktop research of California reports that assess land management industries and activities. Retrieved September 10, 2025. NAICS codes selected include: 111, 112, 112, 11511, 11521, 11531, 22131, 23799, 333111, 54162, 56173, 813312, 92512, 92613.
[73] "Scoping Plan for Achieving Carbon Neutrality." California Air Resources Board (CARB), 2022. https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents
[74] Includes direct, indirect, and induced employment. Figure represents a headcount of jobs in 2045 compared to a baseline scenario.
[75] "Scoping Plan for Achieving Carbon Neutrality." California Air Resources Board (CARB), 2022. https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents
[76] Occupation defined in accordance with the nomenclature of the Standard Occupational Classification system used in federal labor statistics. While this occupational category includes both urban and wildland firefighters, emphasis is placed on wildland firefighters due to their central role in NWL BARCAP measures.
[77] "Service Sharing: How Counties Do More with Less." National Association of Counties, 2017. https://www.naco.org/resources/service-sharing-1
[78] "Farmer and Rancher-Led Climate Change Solutions." California Department of Food and Agriculture, 2021. https://www.cdfa.ca.gov/oefi/climate/docs/cdfa_farmer_and_rancher-led_climate_solutions_meetings_summary.pdf
[79] Titles for this role also include Sustainability Consultant, Energy Strategic Advisor, Sustainable Design Coordinator.
[80] "Living Wage Calculation for San Francisco-Oakland-Berkeley, CA." MIT Living Wage Calculator, 2025. https://livingwage.mit.edu/metros/41860
[81] Data from JobsEQ. 2025Q1. Figures reflect total employment for each occupation across all industries and sectors, not limited to those directly associated with the BARCAP sector.
[82] Percent change in employment across the state of California. Data from Long-Term Occupational Employment Projections, California Open Data Portal (https://data.ca.gov/dataset/long-term-occupational-employment-projections/resource/274e273c-d18c-4d84-b8df-49b4d13c14ce)
[83] Location quotients (LQ) measure the concentration of an occupation in a local/regional area by comparing its share of employment to its share of national employment. An LQ greater than 1 means the occupation is more concentrated locally than nationally, while an LQ less than 1 indicates less concentration. Data from JobsEQ. 2025Q1.
[84] Data from JobsEQ. 2025Q1.

[85] Occupation defined in accordance with the nomenclature of the Standard Occupational Classification system used in federal labor statistics. While this occupational category includes both urban and wildland firefighters, emphasis is placed on wildland firefighters due to their central role in NWL BARCAP measures.
[86] Includes Urban Forestry Planners. Can include planners employed at Resource Conservation Districts.
[87] Includes roles involved in wildfire GIS analysis and environmental analysts. Can include scientists employed at Resource Conservation Districts.
[88] Agricultural Engineers design and implement technologies that improve water efficiency, soil health, and sustainable farming infrastructure. Also called Agricultural Systems Specialist, Conservation Engineer, Field Engineer, Product Engineer, Product Technology Scientist, Research Engineer. Can include engineers employed at Resource Conservation Districts.
[89] O*NET OnLine, U.S. Department of Labor (https://www.onetonline.org/)
[90] Occupation defined in accordance with the nomenclature of the Standard Occupational Classification system used in federal labor statistics. While this occupational category includes both urban and wildland firefighters, emphasis is placed on wildland firefighters due to their central role in NWL BARCAP measures.
[91] CRMs are rangeland professionals recognized in California for applying scientific principles to manage rangelands. The California CRM designation is a state license under the California Board of Forestry and Fire Protection.
[92] Administered by the California Department of Public Health (CDPH).
[93] ISA offers several voluntary certifications that demonstrate a professional arborist has attained a high standard of knowledge and skill in tree care.
[94] Certification offered through the American Institute of Certified Planners (AICP).
[95] Certification offered through the American Planning Association (APA).
[96] CRMs are rangeland professionals recognized in California for applying scientific principles to manage rangelands. The California CRM designation is a state license under the California Board of Forestry and Fire Protection.
[97] Provided by the CA Board of Forestry and Fire Protection.
[98] Provided by the CA Board for Professional Engineers, Land Surveyors, and Geologists (BPELSG).
[99] A CRD is new type of financing district enabled by California's SB 852, which allows cities, counties, and special districts to coordinate across jurisdictional boundaries to implement climate adaptation and resilience strategies. The role of a CRD is to secure public, private, state, and federal funds to support locally-determined climate and clean energy priorities. https://rcpa.ca.gov/what-can-a-climate-resilience-district-do-for-your-community/
[100] This list is not exhaustive, and other key partners and funders in the space may be absent.
[101] Data from JobsEQ. 2025Q1. Figures reflect total employment for each occupation across all industries and sectors, not limited to those directly associated with the BARCAP sector.
[102] Percent change in employment across the state of California. Data from Long-Term Occupational Employment Projections, California Open Data Portal (https://data.ca.gov/dataset/long-term-occupational-employment-projections/resource/274e273c-d18c-4d84-b8df-49b4d13c14ce)
[103] Location quotients (LQ) measure the concentration of an occupation in a local/regional area by comparing its share of employment to its share of national employment. An LQ greater than 1 means the occupation is more concentrated locally than nationally, while an LQ less than 1 indicates less concentration. Data from JobsEQ. 2025Q1.
[104] Data from JobsEQ. 2025Q1.
[105] "Bay Area Priority Climate Action Plan Appendix E: Workforce Planning Analysis Documentation." BW Research and Bay Area Air District, 2024. https://www.baaqmd.gov/en/plans-and-climate/climate-planning/bay-area-regional-climate-action-planning-initiative/priority-climate-action-plan

Appendix A: Methodology

Current and future workforce estimates were derived from existing literature and datasets that highlight activities similar to those outlined in the BARCAP and supplemented with proportional adjustments to reflect region-specific counties. For research that was initially developed at the state level, BARCAP region-specific estimates were scaled using the ratio of BARCAP region employment to state employment within the industries that are most relevant to the respective sectors.

This methodology makes a few assumptions, the greatest being that future growth trends will follow existing growth patterns. This assumption may not hold in instances where entirely new industries are formed, activities occur within industries outside of those originally captured, or where the BARCAP region takes on activities within a sector at an accelerated rate relative to the rest of the state.

In addition, the studies used represent the best available research, yet they do not perfectly align with the full range of activities in the BARCAP measures. Some studies may be more aggressive than the BARCAP measures and lack sufficient detail to better tailor data from the study to the measures. However, the studies are inclusive of the respective measures, align with the scope of the activities conducted and the types of occupations created, and address both the challenges and opportunities involved in building a workforce capable of meeting BARCAP goals. In these instances, the projected future demand may overestimate the number of additional workers needed. Future analyses geared towards providing policymakers and training providers with detailed anticipated workforce estimates may consider utilizing tailored economic impact models built on programmatic cost data or labor-intensity tools to more accurately forecast the quantitative needs for specific occupations.

Transportation Sector

Current and future employment estimates were sourced from the UC Institute of Transportation Study.[1] Additional estimates for Measures T-3 and T-4, which relate to transportation reduction or mode switching as opposed to fuel switching (in Measures T-1 and T-2) were included. These estimates followed the methods utilized in the Bay Area's Priority Climate Action Plan,[2] and proportion the spending utilized in the "Evaluating Benefits from Transportation Investments Aligned with the Climate Action Plan for Transportation Infrastructure (CAPTI)"[3] report to proportion the estimated spending on Measure T-3 and T-4 related activities.

Building Sector

Current employment was calculated by summing county-level Energy Efficiency data from the U.S. Energy and Employment Report across the eight counties in the BARCAP region. Future demand projections were based on the 2019 *California Building Decarbonization Workforce Needs and Recommendations*[4] by UCLA and Inclusive Economics. The research team took these employment estimates and proportioned them to the relative share of devices (heat pumps and NOx-emitting equipment replacement) anticipated to be installed through BARCAP measure B-1.

Power Sector

Current employment was estimated by aggregating county-level Electric Power Generation data from the U.S. Energy and Employment Report. Forecasted demand was based on state-level projections from Vibrant Clean Energy,[5] apportioned to the BARCAP region using the proportion of employment in the region within relevant industries—in this case, Utilities (NAICS 22) relative to the broader state. By utilizing employment within utilities to proportion these employment numbers, much of the employment impacts of constructing large-scale electricity generation projects, which are disproportionately less likely to be built within BARCAP region, are mitigated. Employment within the Utilities sector will continue to be very important as electricity providers increasingly have to monitor, operate, and plan for a greater number of the Distributed Energy Resources (DERs) coming online (as is detailed in BARCAP measures P-1 and P-2).

Waste and Materials Sector

Future employment estimates were taken from existing data from UC Berkeley Labor Center.[6] The report utilized 2016 Bureau of Labor Statistics Occupational Employment and Wage Statistics (BLS OES) data to estimate current employment in this sector. Current employment numbers were taken from the latest BLS OES data (May 2024) for the same NAICS codes used in the report to provide the most up-to-date figures.

Natural and Working Lands Sector

Employment estimates for this sector were derived using the Quarterly Census of Employment and Wages (QCEW) from the California Open Data Portal, aligned with relevant NWL North American Industry Classification System (NAICS) codes. These codes were selected based on the BARCAP definition of the NWL sector and informed by desktop research of California reports that assess land management industries and activities. The following NAICS codes were included: 111, 112, 112, 11511, 11521, 11531, 22131, 23799, 333111, 54162, 56173, 813312, 92512, 92613. Future employment estimates were drawn from economic modeling conducted in the CARB 2022 Scoping Plan.[7]

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[1] "Driving California's Transportation Emissions to Zero." University of California Institute of Transportation Studies, 2021. https://escholarship.org/uc/item/3np3p2t0

[2] "Bay Area Priority Climate Action Plan Appendix E: Workforce Planning Analysis Documentation." BW Research and Bay Area Air District, 2024. https://www.baaqmd.gov/en/plans-and-climate/climate-planning/bay-area-regional-climate-action-planning-initiative/priority-climate-action-plan

[3] "Evaluating Benefits from Transportation Investments Aligned with the Climate Action Plan for Transportation Infrastructure (CAPTI)." San Jose State University Mineta Transportation Institute, 2023. https://transweb.sjsu.edu/sites/default/files/2227-Alexander-California-Climate-Action-Plan-Transportation-Infrastructure.pdf

[4] "California Building Decarbonization Workforce Needs and Recommendations." UCLA Luskin Center for Innovation, 2019. https://innovation.luskin.ucla.edu/wp-content/uploads/2019/11/California_Building_Decarbonization.pdf

[5] "Role of Distributed Generation in Decarbonizing California by 2045." Vibrant Clean Energy, 2021. https://vibrantcleanenergy.com/wp-content/uploads/2021/07/VCE-CCSA_CA_Report.pdf#:~:text=The%20total%20full%20time%20equivalent,scale%20solar%20and%20storage%20by

[6] "Putting California on the High Road: A Jobs and Climate Action Plan for 2030." UC Berkeley Labor Center, 2020. https://laborcenter.berkeley.edu/wp-content/uploads/2020/08/Chapter-9-Waste-Sector-Putting-California-on-the-High-Road.pdf

[7] "Scoping Plan for Achieving Carbon Neutrality." California Air Resources Board (CARB), 2022. https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents

Appendix B: Ecosystem of Initiatives Across BARCAP Sectors

The following list of initiatives and efforts highlights several key organizations that apply to all five sectors. It should not be considered an exhaustive list. See the appendix to this document, Appendix D: References, for links to programs.

Organization / Initiative / Program	Description
Anchoring Worker Cooperative Hubs	Plan to develop worker-owned co-op centers in each Bay Area county to empower excluded workers and expand access to green economy opportunities
High Road to Early Childhood Education Consortium	Expands affordable childcare, addressing the need for subsidized care during non-traditional hours
Regenerative Jobs Program	Offers environmental-based workforce training and holistic career development for underrepresented communities
Clipper START	Provides discounted public transit rides to eligible individuals in Equity Priority Communities to expand job access
Kids Konnect Childcare Financial Assistance Programs	Partners with multiple organizations across California to offer subsidized childcare and provide support to families looking for quality childcare
Bay County ARPA Childcare Grant Program	Awards $300,000 to expand childcare capacity and access in Bay County, addressing workforce shortages and affordability barriers
Oakland Forward	Provides paid employment and career development for youth ages 16–30 in climate resilience, public service, and public safety sectors
Women's Environmental Network (WEN)	Builds a Bay Area community of women advancing environmental leadership, careers, and stewardship
Young Professionals in Energy	Connects energy professionals through networking, tours, and educational events to foster industry leadership and community engagement
East Bay Works	Offers free employment services and support to job seekers and youth through a regional network of job centers and partners
Youth Opportunity Pathways (YOP)	Equips Bay Area youth with career skills and hands-on learning through nonprofit and corporate partnerships, with youth co-designing their pathways
SEI's Climate Corps	A fellowship program that trains and places emerging professionals in sustainability and climate action roles through hands-on project experience

Appendix C: Ecosystem of Funding

The following table outlines several key workforce funding opportunities by sector that are available at the time the BARCAP is published. It does not represent an exhaustive list of available funding. See the appendix to this document, Appendix D: References, for links to funding programs.

A variety of federal and state grant portals, agency solicitation sites, and workforce and climate funding resources informed this funding inventory review, including:

- Grants.gov
- California Grants Portal
- California Energy Commission Solicitations
- Federal Green Economy Public Funding Tracker - UC Berkeley Labor Center
- Department of Labor Grants | U.S. Department of Labor
- Funding Opportunities | Department of Energy
- Funding Resources - California Climate and Energy Collaborative
- Grant Information | California Workforce Development Board
- California Climate Investments Funding Resources
- California Employment Development Department
- California Air Resources Board
- CalRecycle Funding
- California Department of Conservation Funding, Grants, & Easements

BARCAP Sector	Funding Program	Grantor	Description	Funding Amount
All Sectors	Employment and Training Pathways Program (ETPP)	California Employment Development Department	Supports projects that expand access to high-quality, career-connected learning for Californians facing systemic employment barriers, including English language learners, justice-involved individuals, opportunity youth, and veterans	$500,000 – $2,000,000
All Sectors	Sales Tax Exclusion (STE) Program	California State Treasurer's Office	Provides sales and use tax exclusions for manufacturers investing in clean energy, recycling, and advanced manufacturing equipment, supporting innovation and job creation	Total available: $100,000,000
All Sectors	Employment Training Panel (ETP) Funding	California Employment Training Panel	Provides funding to employers to deliver workforce training that upgrades employee skills, supports job retention, and promotes	Case Dependent/TBD

			high-wage, long-term employment opportunities	
All Sectors	Apprenticeship Innovation Funding (AIF)	California Department of Apprenticeship Standards	Invests in expanding and sustaining apprenticeship programs across non-traditional industries to scale workforce development in high-demand sectors	Approx. $22,000,000 for FY25-26
All Sectors	Homeless Veterans Reintegration Workforce Program	U.S. Department of Labor - Veterans Employment and Training Service	Supports veterans reach their full employment potential and obtain high-quality career outcomes; helps veterans return to work by providing job training services that support their needs	Program Funding: $23,000,000 Award Minimum: $150,000 Award Maximum: $500,000
All Sectors	Helping Justice-Involved Reenter Employment (HIRE)	California Workforce Development Board	Aims to increase employment opportunities and job mobility for justice-involved individuals by supporting training, supportive services, reskilling and upskilling, and needs-related payments	Available Funding: $50,000,000 Amount Awarded: $29,289,309
All Sectors	Workforce Accelerator 12 Grant Program	California Workforce Development Board	Supports local workforce board development and implementation of projects that incorporate High Road strategies	Available Funding: $3,000,000 Amount Awarded: $2,900,000
All Sectors	Workforce Accelerator 13 Grant Program	California Workforce Development Board	Focuses on workforce development projects that will drive quality jobs for California workers, incorporating High Road principles into projects that improve job quality, create upward mobility, and bridge workforce programs to quality jobs for workers from disadvantaged or low-income communities	Available Funding: $3,000,000 Amount Awarded: $2,900,000
All Sectors	Employment Pathways Technical Assistance Grant	California Employment Development Department	Provides funding for technical assistance and developmental evaluation to grantees of the PY 25-26 Employment and Training Pathways Program grants	Total available: $1,500,000
Buildings	MCE Support to Grow Contractor Business	MCE	Supports residential contractors in Bay Area counties by offering funding, training stipends, and access to pre-vetted job seekers to help grow their businesses	$3,500+
Buildings	YouthBuild 2025	U.S. Department of Labor - Employment and Training Administration	Provides pre-apprenticeship construction skills training, education, and job placement services to opportunity youth and prepares participants for quality jobs in various industry sectors; includes wrap-around supportive services such as assistance in transportation, childcare, and housing.	Program Funding: $98,000,000 Award Minimum: $1,000,000 Award Maximum: $2,000,000
Natural & Working Lands	Career Pathways Grants Program	Parks California	Funds partnerships that provide career training and mentorship to support workforce development in California parks, integrating	Case Dependent/TBD

			diverse perspectives and Indigenous knowledge into public land stewardship	
Transportation	Caltrans Sustainable Transportation Planning Grant	California Department of Transportation	Funds multimodal transportation and land use planning initiatives that reduce greenhouse gas emissions, improve system performance, and support economic equity by enabling opportunities for individuals with barriers to employment	$50,000 – $700,000
Transportation	Human Resources & Training - 5314 (b)	U.S. Department of Transportation Federal Transit Administration	Supports public transportation workforce development through innovative training, research, outreach to underrepresented populations, and national standard-setting in partnership with industry stakeholders	Case Dependent/TBD
Transportation	CEC Clean Transportation Program	California Energy Commission	Funds workforce training and development initiatives to grow California's zero-emission vehicle and infrastructure workforce, creating long-term career pathways in the clean transportation sector	Case Dependent/TBD
Transportation	Planning Capacity Building Grants	California Air Resources Board	Supports early-stage planning, outreach, workforce development, and community readiness for equitable clean transportation solutions, with a focus on Tribal, rural, school-based, and first-time applicants	Up to $500,000 per award
Transportation	Pay-for-Performance Incentive Payments Program	U.S. Department of Labor - Employment and Training Administration	Incentivizes the expansion and growth of the National Apprenticeship System, specifically in the following sectors: transportation, AI/semiconductors/nuclear energy, IT, healthcare, telecommunication, shipbuilding/defense	Program Funding: $145,000,000 Award Minimum: $10,000,000 Award Maximum: $40,000,000
Waste & Materials	Edible Food Recovery Grant Program	CalRecycle	Funds projects that expand food recovery and waste-reduction efforts to keep food out of CA landfills	TBD

Appendix D: References

Transportation Sector Ecosystem of Key Stakeholders and Programs

1. High Road Clean Transportation Career Pathways - West Oakland Job Resource Center: https://www.allhomeca.org/catalyst-projects/high-road-clean-transportation-career-pathways/
2. Zero Emission Bus University (ZEBU): https://www.actransit.org/zeb
3. CalTrans Workforce Development Branch: https://dot.ca.gov/programs/civil-rights/workforce-development-branch
4. Electric Vehicle Infrastructure Training Program (EVITP) - California Energy Commission: https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program/clean-transportation-funding-areas-2-0
5. California Transit Works! (CTW): https://cwdb.ca.gov/wp-content/uploads/sites/43/2024/10/HRTP-2024.CTW_.High-Road-to-Public-Transit_ACCESSIBLE.pdf
6. Contra Costa Harnessing Change: Refinery Transition Partnership (CCRTP): https://cwdb.ca.gov/wp-content/uploads/sites/43/2023/08/2022.HRTP_.BGAF_.Contra-Costa-Harnessing-Change_ACCESSIBLE.pdf
7. West Oakland Job Resource Center (WOJRC) Regional Transportation, Distribution and Logistics (TDL) Workforce Institute and Expansion: https://cwdb.ca.gov/wp-content/uploads/sites/43/2023/07/2022.HRTP_.WOJRC_.WOJRC-TDL-Institute-and-Expansion_ACCESSIBLE.pdf

Building Sector Ecosystem of Key Stakeholders and Programs

1. Bay Area Regional Energy Network (BayREN): https://www.bayren.org/
2. California Heat Pump Partnership: https://heatpumppartnership.org/wp-content/uploads/2025/03/CAHPP_Blueprint_2025.pdf
3. City of Berkeley's Just Transition Residential Electrification Pilot: https://www.rtebn.org/just-transition
4. California Energy Commission Training for Residential Energy Contractors (CA-TREC): https://www.energy.ca.gov/programs-and-topics/programs/inflation-reduction-act-residential-energy-rebate-programs
5. Construction Trades Workforce Initiative (CWTI): https://ctwi.org/
6. Catalyzing Quality Careers in Building Decarbonization - Rising Sun Center for Opportunity: https://www.allhomeca.org/catalyst-projects/catalyzing-quality-careers-in-building-decarbonization/

7. East Contra Costa Healthy Homes Collaborative - Richmond Community Foundation: https://www.allhomeca.org/catalyst-projects/the-east-contra-costa-healthy-homes-collaborative/
8. JobTrain: https://www.jobtrainworks.org/
9. Bay Area E-Contractor Academy - Emerald Cities Collaborative: https://emeraldcities.org/bayareaecontractoracademy/
10. Opportunity Build - Rising Sun Center for Opportunity: https://risingsunopp.org/programs/opportunity-build/
11. Climate Careers - Rising Sun Center for Opportunity: https://risingsunopp.org/programs/climate-careers/
12. Catalyzing Quality Careers in Building Decarbonization - Rising Sun Center for Opportunity: https://www.allhomeca.org/catalyst-projects/catalyzing-quality-careers-in-building-decarbonization/
13. High School Girls Construction Camp - Trades Women, Inc.: https://www.allhomeca.org/catalyst-projects/twi-high-school-girls-construction-camp/
14. City Build - San Francisco Office of Economic and Workforce Development: https://www.sf.gov/departments--workforce-development-division--citybuild
15. Workforce Development Services - Family & Child Empowerment Services (FACES): https://facessf.org/our-programs/workforce-development/
16. SEI's Energize Careers: https://www.energizecareers.org/participate.html
17. Installation Basics Training 200 (IBT 200) - GRID Alternatives: https://gridalternatives.org/ibt200?faIframeUniqueId=l42sjv4w4k&hostURL=https://gridalternatives.org/ibt200/sign-up&jsid=eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.ImQ5ZGQ2MTQwNTlhMTUwM2VkODY1OWQ5ODA2ZjFkNjRmIg.hCnAewVYIdZuoaSPcjHQgWBZ65hiYZ-si1e0Q8hq0Io
18. NextGen Trades Academy - Lime Foundation: https://www.thelimefoundation.org/nextgen-trades-academy/
19. Construction Industry Workforce Initiative: https://www.ciwi-bayarea.org/home.html
20. Equal Representation in Construction Apprenticeship (ERiCA) Grant - Department of Industrial Relations: https://www.grants.ca.gov/grants/equal-representation-in-construction-apprenticeship-erica-grant/
21. Bay Area High Road Training Partnerships: https://cwdb.ca.gov/initiatives/high-road-training-partnerships/
22. MCE and SEI's Green Construction Job Seekers Program: https://mcecleanenergy.org/green-job-seekers/
23. Silicon Valley Clean Energy Contractor Training: https://svcleanenergy.org/contractor-training/

24. Career Technical Education Foundation: https://ctesonomacounty.org/

Power Sector Ecosystem of Key Stakeholders and Programs

1. PG&E PowerPathway: https://jobs.pge.com/power-pathway
2. Bay Area High-Road Manufacturing Initiative - Working Partnerships USA: https://www.allhomeca.org/catalyst-projects/bay-area-high-road-manufacturing-initiative/
3. GRID Alternatives: https://gridalternatives.org/what-we-do/workforce-development
4. California Community Choice Association (CalCCA): https://cal-cca.org/
5. San Francisco Public Utilities Commission (SFPUC) Apprenticeships and Work Experience Programs: https://www.sfpuc.gov/about-us/careers-sfpuc/apprenticeships-and-work-experience-programs
6. The Energy Skills Collaborative (TESC): https://energyskillsca.org/
7. Bay Area E-Contractor Academy - Emerald Cities Collaborative: https://emeraldcities.org/bayareaecontractoracademy/
8. Bay Area Regional Energy Network (BayREN): https://www.bayren.org/
9. SunWork Volunteer Training Program: https://sunwork.org/volunteer/#get-involved
10. College of San Mateo Electrical Power Systems Certificate: https://collegeofsanmateo.edu/powersystems/
11. Contra Costa Harnessing Change: Refinery Transition Partnership (CCRTP): https://cwdb.ca.gov/wp-content/uploads/sites/43/2023/08/2022.HRTP_.BGAF_.Contra-Costa-Harnessing-Change_ACCESSIBLE.pdf

Waste and Materials Sector Ecosystem of Key Stakeholders and Programs

1. Regenerative Jobs Program - Greenbelt Alliance: https://www.allhomeca.org/catalyst-projects/regenerative-jobs-program/
2. Civicorps: https://cvcorps.org/programs/careers/#career-pathways
3. Conservation Corps North Bay: https://www.ccnorthbay.org/careerpathways/
4. California Climate Action Corps (CCAC) Fellowship: https://www.californiavolunteers.ca.gov/climateactioncorps/
5. Community Composting for Green Spaces – California Alliance for Community Composting: https://www.thecacc.org/projects
6. Gardening and Composting Educator Training Program (Get Up!): https://www.gardenfortheenvironment.org/getup

Natural & Working Lands Sector Ecosystem of Key Stakeholders and Programs

1. Indigenous and Immigrant Farm Workers Building a Climate Resilience Workforce - North Bay Jobs with Justice: https://www.allhomeca.org/catalyst-projects/indigenous-and-immigrant-farm-workers-building-a-climate-resilience-workforce/
2. Regenerative Jobs Program: https://www.allhomeca.org/catalyst-projects/regenerative-jobs-program/
3. Civicorps: https://cvcorps.org/programs/careers/#career-pathways
4. Friends of the Urban Forest: https://www.friendsoftheurbanforest.org/workforce-development
5. Conservation Corps North Bay: https://www.ccnorthbay.org/careerpathways/
6. Providing High-Road Jobs to Latin Women Serving Their Community - UpValley Family Centers of Napa County: https://www.allhomeca.org/catalyst-projects/providing-high-road-jobs-to-latina-women-serving-their-community/
7. Agricultural Worker Training and Advancement with High Road Employers (Ag HiRE): https://cwdb.ca.gov/wp-content/uploads/sites/43/2023/07/2022.HRTP_.CLBL_.Agricultural-Worker-Training-and-Advancement_ACCESSIBLE.pdf
8. Bay Area Farmer-to-Farmer Training (BAFFT) - Agroecology Commons: https://www.agroecologycommons.org/community-education
9. Farmer Mobilization Apprenticeships and Mentorship – Agroecology Commons: https://www.agroecologycommons.org/community-education
10. California Conservation Corps Training and Workforce Development Program: https://www.caclimateinvestments.ca.gov/training-workforce
11. Environmental Management Social Enterprise - Civicorps: https://cvcorps.org/impact/projects/#conservation
12. California Climate Action Corps (CCAC) Fellowship: https://www.californiavolunteers.ca.gov/climateactioncorps/
13. California Water, Wastewater, and Energy Workforce Development Program - Municipal Utilities Association: https://cwdb.ca.gov/wp-content/uploads/sites/43/2023/07/2022.HRTP_.CMUA_.California-Water-Wastewater-and-Energy_ACCESSIBLE.pdf
14. CAL FIRE Training Centers: https://www.fire.ca.gov/what-we-do/fire-protection/training-center
15. Las Positas College East Bay Regional Fire Academy: https://www.laspositascollege.edu/fst/academy.php?
16. Chabot College Fire Technology Program: https://www.chabotfire.com/
17. City College of San Francisco Fire Academy: https://www.ccsf.edu/academics/schools/allied-health-physical-education-social-services/administration-justice-fire-science-department/ccsf-fire-academy

18. South Bay Fire Fighter 1 & 2 Academy: https://theacademy.ca.gov/firefighter_1_academy/?
19. Center for Land-Based Learning California Farm Academy: https://www.landbasedlearning.org/california-farm-academy/
20. Farm and Land Steward Apprenticeship Program – San Francisco Zen Center: https://www.sfzc.org/locations/green-gulch-farm/about-green-gulch/farm-garden-programs/farm-land-steward-apprenticeship
21. Alemany Farm Internships: https://alemanyfarm.org/internships/
22. Regenerative Agriculture Farm Training (RAFT) - California Native Garden Foundation (CNGF): https://cngforg.wixsite.com/cngf/raft
23. University of California Cooperative Extension: https://ucanr.edu/site/division-agriculture-and-natural-resources/locations
24. California Resource Conservation Districts (RCDs): https://carcd.org/
25. Santa Rosa Junior College Sustainable Agriculture Program: https://ag.santarosa.edu/sustainable-agriculture

All Sectors Ecosystem of Key Stakeholders and Programs

1. Anchoring Worker Cooperative Hubs: https://www.allhomeca.org/catalyst-projects/anchoring-worker-cooperative-hubs/
2. High Road to Early Childhood Education Consortium: https://www.allhomeca.org/catalyst-projects/high-road-to-early-childhood-education-consortium/
3. Regenerative Jobs Program: https://www.allhomeca.org/catalyst-projects/regenerative-jobs-program/
4. Clipper START: https://www.clipperstartcard.com/s/
5. Kids Konnect Childcare Financial Assistance Programs: https://www.kids-konnect.com/financial-help-childcare
6. Bay County ARPA Childcare Grant Program: https://bayfoundation.org/2023/09/18/elevating-early-childhood-care-in-bay-county-bay-county-arpa-childcare-grant-program/
7. Oakland Forward: https://www.oaklandca.gov/Shared-Content/Oakland-Forward
8. Women's Environmental Network (WEN): https://wencal.org/
9. Young Professionals in Energy: https://www.ypesfbayarea.org/
10. East Bay Works: https://www.eastbayworks.com/
11. Youth Opportunity Pathways (YOP): https://uwba.org/what-we-do/youth-opportunity-pathways/
12. SEI's Climate Corps: https://www.climatecorps.org/

Ecosystem of Funding

1. Employment and Training Pathways Program (ETPP): https://www.grants.ca.gov/grants/employment-and-training-pathways-program-etpp-program-year-2025-26-py-25-26/
2. Sales Tax Exclusion (STE) Program: https://www.grants.ca.gov/grants/sales-tax-exclusion-ste-program/
3. Employment Training Panel (ETP) Funding: https://etp.ca.gov/
4. Apprenticeship Innovation Funding (AIF): https://www.dir.ca.gov/DAS/Grants/Apprenticeship-Innovation-Funding.html
5. Homeless Veterans Reintegration Workforce Program: https://simpler.grants.gov/opportunity/d3833aae-4c7a-4fcd-b92d-9bf547495a3b
6. Helping Justice-Involved Reenter Employment (HIRE): https://cwdb.ca.gov/cwdb-home/grant-information/hire-grant-program/
7. Workforce Accelerator 12 Grant Program: https://cwdb.ca.gov/cwdb-home/grant-information/accelerator-12/
8. Workforce Accelerator 13 Grant Program: https://cwdb.ca.gov/cwdb-home/grant-information/accelerator-13-2/
9. Employment Pathways Technical Assistance Grant: https://edd.ca.gov/en/jobs_and_training/Information_Notices/wsin25-13/
10. MCE Support to Grow Contractor Business: https://mcecleanenergy.org/grow-your-business-expertise/
11. YouthBuild 2025: https://simpler.grants.gov/opportunity/e1f118fb-8e9d-4c86-b0c3-e9e5c5e0b59d
12. Career Pathways Grants Program: https://parkscalifornia.org/park-projects/career-pathways/
13. Caltrans Sustainable Transportation Planning Grant: https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/regional-and-community-planning/sustainable-transportation-planning-grants
14. Human Resources & Training - 5314 (b): https://www.transit.dot.gov/funding/grants/human-resources-training-5314-b
15. CEC Clean Transportation Program: https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program/clean-transportation-funding-areas-2
16. Planning Capacity Building Grants: https://ww2.arb.ca.gov/resources/documents/2025-planning-and-capacity-building-request-applications
17. Pay-for-Performance Incentive Payments Program: https://simpler.grants.gov/opportunity/1b980077-90a8-43e8-9781-3546c2e9f50c
18. Edible Food Recovery Grant Program: https://calrecycle.ca.gov/funding/foodwaste/

Appendix G
Funding Roadmaps

March 2026

Bay Area Regional Climate Action Plan

Building a Resilient Climate Action Funding and Financing Strategy: Pathways to Capital for the Bay Area Regional Climate Action Plan

Produced by HIP (Human Impact + Profit) Investor, www.HIPinvestor.com

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The Climate Action Funding and Financing Strategy distills HIP Investor's research on sources of capital for climate action for the Bay Area Regional Climate Action Plan (BARCAP). The resulting roadmap provides a practical framework to guide local governments and communities in mobilizing a resilient mix of capital types, partners, and resources for equitable climate action.

Over the past two years, HIP has worked closely with the Bay Area Air District (Air District) to develop a strategic approach to funding and financing climate action. Initially, HIP and the Air District co-developed a database of Federal, State, and Local climate funding programs, and an assessment of funding gaps for a targeted regional Priority Climate Action Plan (or PCAP).

For the BARCAP, HIP and the Air District collaborated to identify high-impact, capital-intensive climate action measures to match against HIP's catalog of more than 100 funding mechanisms and assemble a menu of viable pathways to capital. These funding pathways span grants, public-private partnership structures, loans, private credit, bonds, taxes, and fees – which offer multiple options to cover both the governmental and community costs of implementing the BARCAP.

This funding strategy is not intended to list every possible grant or loan program in existence. Instead, it illustrates the breadth of funding sources that can support BARCAP measures and provides examples that have been implemented at least once nationally or globally – thus offering a pragmatic roadmap for implementation.

Each listed pathway (framed horizontally) is organized by the following: capital type, potential funding pathway, key partners or resources, and a tailored case study, with an emphasis on Bay Area and California examples to support local adoption. Any specific resources, partners, and case studies mentioned are not endorsements, but potential collaborators who have implemented at least one similar project.

The funding strategies shown here demonstrate that ambitious climate action can be fiscally sound, relying on a balanced blend of capital rather than solely on taxes, fees, debt, municipal bonds, or general fund expenditures.

When structured appropriately, financed projects can generate savings and revenue that exceed repayment costs. Grants can be a limited resource for pilot projects to prove a concept when the internal resources exist to manage the application and tracking process. Public-private partnerships allow governments to offload portions of project financing and performance risk to private partners, often at the cost of sharing future revenues or limiting potential gains for the public sector, as in an energy savings performance contract or a power purchase agreement.

The deliberate and disciplined blending of grants, public capital, private investment, and risk-sharing structures in these funding pathways results in a real-world framework for supporting climate action.

Bay Area Air District

Climate Action Funding & Financing Map

Pathways to Capital for The Bay Area Regional Climate Action Plan

February 2026

Regional Climate Action Strategy	Capital Types	Top Funding and Finance Pathways	Programs and Partners	Case Examples
POWER SECTOR **Measure P-1** Increase Development of In Front-Of-The-Meter Small and Medium Sized Local Clean Energy Projects	**GRANT**	State Grants via CA Energy Commission	CERRI	Anaheim PUB
	GRANT	State Grants via CA Public Utilities Commission	EPIC Grant, CSGT and DAC-GT	Ava / Oakland, CA Adelanto, CA
	GRANT	State Grant via CA Strategic Growth Council	Transformative Climate Communities (TCC)	Stockton, CA Pacoima / Sun Valley
	GRANT	Federal & State Grants via Solar For All **	California iBank GRID Alternatives	Energy For All
	GRANT	Federal & State Grants via EPA	Brownfield Revolving Loan Fund Grant Program	Carson, CA
	GRANT	Federal Grant via Department of Energy	Grid Resilience & Innovation Partnerships (GRIP)	Entergy New Orleans Redwood Coast
	PARTNER	DOE Technical Assistance	Nat Com Solar Partn (NCSP) Office of Indian Energy	Canal Lines LLC San Pasqual Mission
	PARTNER	Power Purchasing Agreement	ENGIE, Ameresco GRID Alternatives	Glendale, San Jose, CA, Oxon Run DC
	PARTNER	Collaborative Community Ownership	Inclusive Prosperity Capital People Powered Solar Coop	Oakland, CA Boardman Hill, VT
	PARTNER	Utility-Led Incentives *	PG&E / CPUC CMIP & MIP Microgrid Incentive Program	9 Nor Cal Microgrids
	LOAN	Tax-Exempt Lease Purchase Agreement	GS (Golden State) $mart	Bloomington, IN
	LOAN	Green Bank or Revolving Loan Fund	Coalition For Green Capital	Washington DC
	LOAN	State Revolving Loan Fund	Infrastructure State Revolving Fund (ISRF) Program	Orange County Library
	LOAN	Private Investment Firm Loan	Generate Capital	Goldenrod Mercer, IL MCE Richmond
	BOND	General Obligation Bond (Green)	California Infrastructure and Econ. Dev. Bank (IBank)	Bright Farms DeKalb County, IL

Measure P-1: Increase Development of Local Clean Energy and Storage Projects (with a Focus on Small- to Medium-Scale Projects), Including Behind-the-Meter and Distributed Energy Resources

Pathways highlighted in darker gray are particularly applicable and/or accessible to the Bay Area Community

** Indicates a pathway may Involve Residential & Commercial Costs*

*** Pathway cancelation currently under dispute or may not have future funding*

**** Case Study is an imperfect fit, but the measure is fundable through this pathway and program*

Resources, partners, and case studies are not endorsements, but examples where at least one similar project has been implemented

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Bay Area Air District

Climate Action Funding & Financing Map

Pathways to Capital for The Bay Area Regional Climate Action Plan

February 2026

Regional Climate Action Strategy	Capital Types	Top Funding and Finance Pathways	Programs and Partners	Case Examples
POWER SECTOR **Measure P-1** Increase Development of Behind -The-Meter Local Clean Energy Projects	GRANT	State Grant via CA Energy Commission	BUILD, CalEHP	CalEHP (Electric Homes Program)
	GRANT	State Grant via CA Strategic Growth Council	Transformative Climate Communities (TCC)	West Fresno, CA
	GRANT	Federal & State Grants via Solar For All **	California iBank Grid Alternatives	Energy For All
	PARTNER	State Solar Incentives for Disadvantaged Communities	Grid Alternatives DAC-SASH	PG&E Projects
	PARTNER	State Incentive Program (CA-PUC)*	Solar on Multi-Family Affordable Housing (SOMAH)	Saint Mary's Oakland,CA
	PARTNER	State Incentive Program (CA-PUC)*	Self-Generation Incentive (SGIP)	SGIP Self Generation Incentive Program
	PARTNER	Energy Savings Performance Contracts	Ameresco, CMTA	Grant Co. Schools, WV
	PARTNER	Private Financing + Project Management	ENGIE North Am	Belle Haven, Menlo Park, CA
	LOAN	Solar Billing Plan / On-Bill Financing (Tariff) *	PG&E Net Billing Plan PG&E On-Bill Financing	San Jose, CA Bay Area Home
	LOAN	PACE or C-PACE Financing *	CaliforniaFirst / Renew Financial	Sunnyvalley Smoked Meats, Manteca, CA
	LOAN	Green Bank or Revolving Loan Fund *	Coalition For Green Capital	Connecticut Green Bank
	LOAN	Federal or State Loan Program *	GoGreen Financing	GoGreen Case Studies
	LOAN	State Revolving Loan Fund	Infrastructure State Revolving Fund (ISRF) Program	Orange County Library
	LOAN	Federal Loan Program *	Energy Efficiency and Conservation Loan Program	REAP (Rural Energy for America) Recipients
	LOAN	HomeStyle Energy Mortgage *	Fannie Mae, New American Funding	Agrisolar & Fannie Mae, GBREB sample

Measure P-1: Increase Development of Local Clean Energy and Storage Projects (with a Focus on Small- to Medium-Scale Projects), Including Behind-the-Meter and Distributed Energy Resources

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BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Climate Action Funding & Financing Map

Pathways to Capital for The Bay Area Regional Climate Action Plan

February 2026

Regional Climate Action Strategy	Capital Types	Top Funding and Finance Pathways	Programs and Partners	Case Examples
Power Sector **Measure P-2.1** Increase Key Public & Community Facilities with Clean Resilience Power and Storage	**GRANT**	State Grants via Governor's Office / Integrated Climate Adaptation and Resiliency Programs (ICARP)	Regional Resilience Planning & Implementation Grant Program	2023 ICARP Grantees
	GRANT	State Grant via CA Strategic Growth Council	Community Resilience Centers Grant Program	2024 CRC Planning Grantees
	GRANT	Federal Grants via FEMA	FEMA Hazard Mitigation Program (BRIC Program)	St. Croix, U.S. Virgin Islands (USVI)
	GRANT	Federal Grants via Department of Energy	Grid Resilience & Innovation Partnerships (GRIP)	The Hoopa, Yurok, and Karuk Tribes
	GRANT	Foundation Grants *for all aspects of Resilience Hubs*	Hilton Foundation ; California Resilience Partnership	San Diego, CA
	PARTNER	Utility-Led Incentives *	PG&E / CPUC CMIP & MIP Microgrid Incentive Program	9 NorCal Microgrids
	PARTNER	Public Private Partnership (PPP)	BayREN Pub. Building Assist Gridscape Solutions	Fremont, CA White Earth Nation
	PARTNER	Nonprofits, Educational Institutions, Libraries and/or Foundations as locations	BayREN Community Resilience Center Res.	West Oakland Branch Library
	LOAN	Private Investment Loan *for microgrid and efficiency costs*	Generate Capital	Green Mountain, NC
	LOAN	State Low Interest Loans	Energy Conservation Assist. Act Low-Interest Loans	San Diego, CA
	LOAN	Green Bank	Coalition For Green Capital	Takoma Park, MD
	BOND	General Obligation Bond (Green)	California Infrastructure and Econ. Dev. Bank (IBank)	Lincoln Square Park Oakland, CA

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 end use.

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Bay Area Air District

Climate Action Funding & Financing Map

Pathways to Capital for The Bay Area Regional Climate Action Plan

February 2026

Regional Climate Action Strategy	Capital Types	Top Funding and Finance Pathways	Programs and Partners	Case Examples
Power Sector **Measure B-1, B-2, B-3** Advance Decarbonization & Public Health Through Electrification & Energy Efficiency	**GRANT**	State Grant via CA Energy Commission	BUILD (Low Emissions Dev.) CalEHP (Electric Homes Prog)	Rancho Cordova, CA CalEHP Impact Map
	GRANT	State Grant via CA Strategic Growth Council	Transformative Climate Communities (TCC)	West Fresno, CA
	GRANT	State Grant for Workforce Training	Cal EDD ETPP Cal ETP	NYSERDA's Workforce Development (WFD)
	PARTNER	State Incentives via Golden State Rebate*	Golden State Rebates	Buyers Guide
	PARTNER	Utility and CCA-led Incentives *	PCE Rebates Program PG&E Business Rebates	San Mateo Co. BayREN Lincoln Ave
	PARTNER	Weatherization Assistance Programs (WAP) + Incentives *	BayREN EASE Program CA Weatherization AP	Madera County, CA
	PARTNER	Statewide Incentives Program	TECH Clean California	Redwood Coast Energy Authority
	PARTNER	Energy Savings Performance Contracts	Ameresco, Schneider Electric	Anderson, CA Westin Rancho Mirage
	PARTNER	Public Private Partnerships (PPPs)	CA Heat Pump Partnership (CAHPP)	New Program Blueprint
	PARTNER	Private Financing + Project Management	ENGIE North America	Belle Haven, Menlo Park, CA
	LOAN	On-Bill Financing *	PG&E Energy Efficiency Financing (EEF) Program	Clayburn Apartments, San Jose, CA
	LOAN	PACE or C-PACE Financing *	CaliforniaFirst / Renew Financial	Sunnyvalley Smoked Meats, Manteca, CA
	LOAN	Green Bank or Revolving Loan Fund *	Coalition For Green Capital	Connecticut Green Bank
	LOAN	Federal or State Loan Program *	GoGreen Financing	Meadowcrest Energy Upgrade (Sherman Oaks, CA)
	LOAN	Federal Loan Program *	Energy Efficiency and Conservation Loan Program	REAP: Rural Energy for America (Recipients)
	LOAN	HomeStyle Energy Mortgage *	Fannie Mae, New American Funding	Roc360 Case Studies

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

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-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

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Bay Area Air District

Climate Action Funding & Financing Map

Pathways to Capital for The Bay Area Regional Climate Action Plan

February 2026

Regional Climate Action Strategy	Capital Types	Top Funding and Finance Pathways	Programs and Partners	Case Examples
TRANSPORTATION SECTOR **Measure T-1** Accelerate Light-Duty Electric Vehicle and Charging Adoption `T-1: Accelerate Light-Duty Electric Vehicle Adoption	**GRANT**	State Grants via CARB / Bay Area Air District	Clean Cars 4 All Charge! Program	SF, Oakland, Vallejo, San Rafael, and more
	GRANT	State Grant via CARB	Planning and Capacity Building Grants	Pittsburg, Pleasanton San Mateo, and more
	GRANT	Federal & State Grants via CEC and Caltrans	National EV Infrastructure Formula Program (NEVI)	Boulder County, CO
	PARTNER	Tribal Nations Technical Assistance	Technical Assistance for Tribal Nations	San Pasqual Mission Indians Microgrid
	PARTNER	Federal Incentives	EV Charging Property Tax Credit (30C)	Stanford Analysis
	PARTNER	Utility Incentives, Pricing Plans, & Rebates *	Alameda Municipal Power; PG&E Rebates	Avista Corp - PNW; C40: Oslo, Shenzhen
	PARTNER	PPP with Operations and Maintenance *	Carbon Solutions Group; Blink; ChargePoint	Porterville, CA
	PARTNER	State Infrastructure Incentive Program *	CALeVIP; Communities In Charge	Livermore, Fremont, San Jose, and more
	LOAN	State Loan (with Loan Loss Reserve) *	CalCAP (current lender list)	Los Angeles + Noodoe EV
	FEE	Variable Pricing Model, Idling Fee	Carbon Solutions Group; NovaCHARGE	Chapel Hill, NC

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Bay Area Air District

Climate Action Funding & Financing Map

Pathways to Capital for The Bay Area Regional Climate Action Plan

February 2026

Regional Climate Action Strategy	Capital Types	Top Funding and Finance Pathways	Programs and Partners	Case Examples
TRANSPORTATION SECTOR **Measure T-2, T-3** Accelerate Medium- and Heavy-Duty Electric Vehicle and Charging Adoption Measure T-2: Accelerate Medium- and Heavy-Duty Vehicle and Equipment Decarbonization T-3: Accelerate Decarbonization of Goods Movement	**GRANT**	State Grants via CARB	Clean Truck & Bus Vouchers (HVIP), Clean Mobility In Schools	Outcomes & Results
	GRANT	State Grants via CARB	Planning and Capacity Building Grants	CMO Awards Dashboard
	GRANT	State Grant via CalSta	Zero-Emission Transit Capital Program	BART, UCLA & Central Costa Costa
	GRANT	State Grant via CEC Clean Transportation Program	Charging Infrastructure for Medium- and Heavy-Duty	Long Beach, CA
	GRANT	Federal / State Grants via CEC and Caltrans	National EV Infrastructure Formula Program (NEVI)	Boulder County, CO
	PARTNER	Tribal Nations Technical Assistance	Technical Assistance for Tribal Nations	San Pasqual Mission Indians Microgrid
	PARTNER	Incentives From CARB / Bay Area Air District *	Carl Moyer Memorial Program	2024 Program Stats
	PARTNER	Utility Incentives, Pricing Plans, & Rebates *	CEC EnergIIZE, PG&E Grants & Incentives	SF Trolley, C40 Energize Impact Map
	PARTNER	PPP with Operations and Maintenance *	Carbon Solutions Group Blink, ChargePoint	Porterville, CA
	PARTNER	PPP with 'Fleet-as-a-Service' *	Carbon Solutions Group NovaCHARGE	Montgomery Schools
	PARTNER	State Infrastructure Incentive Program *	CALeVIP	Current Projects
	LOAN	State Loan via CARB *	Zero-Emission Truck Loan, Infrastructure Loan Pilot	Outcomes & Results
	LOAN	State Loan (with Loan Loss Reserve) *	CalCAP Zero-Emission Heavy-Duty Programs	Los Angeles + Noodoe EV

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Bay Area Air District

Climate Action Funding & Financing Map

Pathways to Capital for The Bay Area Regional Climate Action Plan

February 2026

Regional Climate Action Strategy	Capital Types	Top Funding and Finance Pathways	Programs and Partners	Case Examples
TRANSPORTATION **Measures T-4 Plan Bay Area** Increase Access To Active Transportation, Transit, and Micro-Mobility (Plan Bay Area) Measure T-4: Support Implementation of Plan Bay Area 2050+	**GRANT**	State Grant via Caltrans	Active Transportation Program	Santa Barbara, CA
	GRANT	State Grant via CA Strategic Growth Council	Transformative Climate Communities (TCC)	Ontario, CA
	GRANT	State Vouchers via CARB & CEC	Clean Mobility Options Pilot Program (CMO)	San Jose, CA
	GRANT	Fed Grant via Department of Transportation	Buses & Bus Facilities Grants Program	Alameda-Contra Costa Transit District
	GRANT	Fed Grant via Department of Transportation	Capital Investment Grants Program	San Francisco, CA
	GRANT	Fed Grant via Department of Transportation	Reconnecting Communities Pilot Grant Program	Alameda CTC Philadelphia, PA
	GRANT	Fed Grant via Department of Transportation	Active Transportation Infrastructure Inv. Prog **	Yolo County, CA
	GRANT	Foundation Grants	People for Bikes; Outride	American Falls, Idaho
	PARTNER	PPP with Economic Development Council	Bay Area Council	Chattanooga, TN; Indianapolis Cultural
	PARTNER	PPP with Local Employers	Bay Area Council Economic Institute	Bay Area Shuttles St. Paul, MN
	PARTNER	PPP with 'Fleet-as-a-Service' *	PhoenixEV / Proterra	Santa Rosa, CA Valley Regional
	LOAN	State Government Loan Program	Infra. State Revolving Fund (ISRF) Program	Santa Cruz, CA
	LOAN	Federal Government Loan Program	TIFIA Transport Infra. and Innovation Act: Loan	State of Maryland
	BOND	General Obligation Bond	CA Alternative Energy & Adv Transp Fin Auth (CAEATFA)	San Diego County, CA
	FEE	Developer Impact Fee *	San Francisco Planning	Santa Monica, CA Watsonville, CA
	TAX	Enhanced Infrastructure Financing District *	Enhanced Infrastructure Financing District (CALED)	Los Angeles County, CA

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Bay Area Air District

Climate Action Funding & Financing Map

Pathways to Capital for The Bay Area Regional Climate Action Plan

February 2026

Regional Climate Action Strategy	Capital Types	Top Funding and Finance Pathways	Programs and Partners	Case Examples
NATURAL AND WORKING LANDS SECTOR **Measures NWL-4** Expand and Maintain Urban Green Spaces While Advancing Environmental Justice Outcomes	**GRANT**	State Grant via Cal State Parks	Statewide Park Development and Community Revitalization Program	Richmond, CA
	GRANT	State Grant via California Natural Resources Agency	Environmental Enhancement & Mitigation Grant Program **	Los Angeles, CA
	GRANT	State Grant via CalRecycles	Community Composting for Green Spaces Grant	Fresno "Yo'Ville" Community Garden
	GRANT	Federal Grant via The Forest Service	Urban and Community Forestry Program	Manchester, NH
	GRANT	Local Grants via UC Berkeley	UC Berkeley: Chancellor's Community Partnership Fund	Berkeley, CA
	PARTNER	Private Public Partnership	CIS Solutions	Prince George's County, Maryland
	PARTNER	Community Based Partnership	Green Print Partners	SFPUC Greenprint Milwaukee MMSD
	LOAN	Federal Loan via Environmental Protection Agency (EPA)	Clean Water State Revolving Fund	El Cerrito, CA
	BOND	General Obligation Bond (Green)	California Infrastructure and Econ. Dev. Bank (IBank)	Prop 4 Climate Bond
	BOND	Environmental Impact Bond	Quantified Ventures	Southwest Colorado
	Incentive	Stormwater Credits*	SFPUC Stormwater Components & Credits	Springfield, OH
	Tax	Tax increment financing*	Enhanced Infra. Financing District Pub. Auth'y (EIFD)	Redondo Beach, CA; SD River Park District

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

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Climate Action Funding & Financing Map

Pathways to Capital for The Bay Area Regional Climate Action Plan

February 2026

Bay Area Air District

Regional Climate Action Strategy	Capital Types	Top Funding and Finance Pathways	Programs and Partners	Case Examples
NATURAL AND WORKING LANDS **Measures NWL-2, NWL-3,** Accelerate Implementation of Climate Beneficial Agriculture	**GRANT**	State Grant via California Dept. of Food & Agriculture	Healthy Soils Program	Sacramento, CA (Loewen Family Farm)
	GRANT	State Grant via CAL FIRE	Wildfire Prevention Grants	Nevada County, CA
	GRANT	State Grant via UC Agriculture Research & Education Program	Sustainable Agriculture and Food Systems small Grant	Oakland, CA
	GRANT	State Grant via CARB & Bay Area Air District	Funding Agricultural Replacement for Emission Reduction	San Joaquin, CA
	GRANT	Grants and on farm support	Zero Foodprint, Marin County Fare Program	San Rafael, CA San Diego, CA
	GRANT	Federal Grant via The Forest Service	Joint Chiefs' Landscape Restoration Partnership	Blackfoot River, MT
	GRANT	Federal Grant via The Forest Service	Community Wildfire Defense Grant Program	Lake County, CA
	GRANT	Federal Grant via Natural Resources Conservation Service	Conservation Tech. Assist Conservation Stewardship	Iowa Farmers
	GRANT	Federal Grant via Natural Resources Conservation Service	Regional Conservation Partnership Program (RCPP)	San Diego County
	GRANT	Federal Grant via Natural Resources Conservation Service	Environmental Quality Incentives Program (EQIP)	Fresno County, CA (McMullen Area Project)
	PARTNER	State Tax Credit via State Natural Heritage Preservation Tax Credit Program	Conservation Easements	Henry Ranch, near Napa Co., CA
	PARTNER	Private Public Partnership	Alameda County RCD, Carbon Cycle Institute, Fibershed	Marin County, CA
	LOAN	Federal Loan via Environmental Protection Agency (EPA)	Clean Water State Revolving Fund	San Francisco, CA
	BOND	Environmental Impact Bond	Quantified Ventures	Southwest Colorado

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

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

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Regional Climate Action Strategy	Capital Types	Top Funding and Finance Pathways	Programs and Partners	Case Examples
NATURAL AND WORKING LANDS (NWL) SECTOR **Measures NWL-1.2, NWL 2.2, 2.3** Reduce Wildfire and Increase Fuels Management	**GRANT**	State Grant via California Natural Resources Agency	Tribal Nature-Based Solutions	Amah Mutsun Tribe
	GRANT	State Grant via CAL FIRE	Wildfire Prevention Grants & Tribal Wildfire Resil. Grants	Butte County; Koy'o Land Conserv.
	GRANT	Grants via Prop 4 through CAL FIRE	CalFire Regional Programs	Diablo Range, CA
	GRANT	Federal Grant via The Forest Service	Joint Chiefs' Landscape Restoration Partnership	Blackfoot River, MT
	GRANT	Federal Grant via The Forest Service	Community Wildfire Defense Grant Program	Lake County, CA
	GRANT	State Grant via Coastal Conservancy	Wildfire Resilience Program	Big Basin Redwood Wildfire Resilience
	GRANT	Grants Private Foundations & Philanthropy	Climate Smart Communities Initiative	New Orleans: Nevada Co. CA; and more
	PARTNER	Public Private Partnership via Dept Of Interior	Fuels Management Program and Preparedness Program	Animas City, CO
	PARTNER	Public Private Partnership Network	Climate Resilience Fund	Gordon and Betty Moore Foundation
	PARTNER	Network Technical Assistance	Fire Adapted Communities Learning Network	Montana Dept of Nat Res and Conservation
	PARTNER	Technical Assistance via US Forest Service	Community Mitigation Assistance Team (CMAT)	Lake Co. CA; Santa Fe NM; Mt. Hood OR, and more
	PARTNER	Network Technical Assistance & Certification	Firewise, CA Wildfire & Forest Resilience Task Force	CA Insurance Discounts
	PARTNER	Community Benefits Agreement	PowerSwitch Action	Lincoln County, MN
	LOAN	Federal Loan via Environmental Protection Agency (EPA)	Clean Water State Revolving Fund	Flagstaff, AZ; Yurok Tribe, CA
	BOND	Environmental Impact Bond (defined here)	Quantified Ventures	Southwest Colorado
	Tax	Personal Tax Benefits	WILTR: Wildlife Infra. And Land Tax Relief Act (proposed)	NC Tax Credit
	Tax	Tax Increment Financing (TIF); and Climate Resilience District	Regional Climate Protection Authority. ABAG	Sonoma County (Reg. Climate Prot. Auth'y)

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

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

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

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Bay Area Air District

Climate Action Funding & Financing Map

Pathways to Capital for The Bay Area Regional Climate Action Plan

February 2026

Regional Climate Action Strategy	Capital Types	Top Funding and Finance Pathways	Programs and Partners	Case Examples
NATURAL AND WORKING LANDS SECTOR **Measures NWL-2.1** Increase Land Conservation Measure NWL-2: Prevent Losses of Carbon Held in Natural and 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	GRANT	State Grant via California Natural Resources Agency	Envir Enhancement Mitigation Tribal Nature-Based Solutions	Anaheim; Chino Hills CA; and local NGOs
	GRANT	Grant via Metro. Planning Commission (MTC)	Priority Conservation Area (PCA) Grants	Napa Soscol Headwaters Preserve
	GRANT	State Grant via Coastal Conservancy	Coastal Conservancy Grants	Trust For Public Land Sonoma Ecology Center
	GRANT	Federal Grant via The Forest Service	Joint Chiefs' Landscape Restoration Partnership	Blackfoot River, MT
	GRANT	Federal Grant via Natural Resources Conservation Service	Conservation Technical Assistance	Iowa Farmers
	GRANT	Federal Grant via Natural Resources Conservation Service	Regional Conservation Partnership Program (RCPP)	San Diego County
	PARTNER	Conservation Easements	Sonoma Open Space Peninsula Open Space Trust	Santa Clara Valley
	PARTNER	Incentive / Tax Credit For Conservation Easement Donation	Natural Heritage Preservation Program	Henry Ranch, near Napa Co., CA
	PARTNER	Carbon Credits	The Conservation Fund	Preservation Ranch Sonoma, CA
	PARTNER	Community Benefits Agreement	PowerSwitch Action	Los Angeles, CA
	LOAN	Federal Loan via Environmental Protection Agency (EPA)	Clean Water State Revolving Fund	Yurok Tribe, CA
	BOND	General Obligation Bond (Green)	California Infrastructure and Econ. Dev. Bank (IBank)	Buncombe Co, NC Prop 4 Climate Bond

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Bay Area Air District

Climate Action Funding & Financing Map

Pathways to Capital for The Bay Area Regional Climate Action Plan

February 2026

Regional Climate Action Strategy	Capital Types	Top Funding and Finance Pathways	Programs and Partners	Case Examples
WASTE & MATERIALS **Measures W-1** Expand Access To Edible Food Waste Programs	**GRANT**	State Grant via CalRecycle	Community Composting for Green Spaces Grant	Fresno "Yo'Ville" Community Farm
	GRANT	State Grant via CalRecycle	Organics Grant Program	Foodbank of Santa Barbara
	GRANT	State Grant via California Natural Resources Agency	Urban Greening Program Envir Enhance. & Mitigation	San Pablo, Alameda Co., Watsonville, CA
	GRANT	State Grant via CA Strategic Growth Council	Transformative Climate Communities (TCC)	Fresno, CA
	GRANT	Local Grant	StopWaste, Altamont Education Advisory Board	Tri-Valley Haven Oakland USD
	GRANT	Fed Grant via EPA	Consumer Recycling Education and Outreach Grant Program **	Tacoma, WA
	GRANT	Philanthropic Grants	ReFED	New York State
	PARTNER	Public-Private Partnership	Recology	San Francisco, CA
	LOAN	State Government Loan Program	Recycling Market Development Revolving Loan Program	Riverside County, CA
	BOND	Tax-Exempt Bond - Loan Financing	California Pollution Control Financing Authority	Napa Recycling & Waste Services, LLC
	FEE	Land Tipping Fee*	CalRecycle	Alameda County, CA

Measure W-1: Enable Food Access and Clean Compost

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Appendix H
Glossary

March 2026
Bay Area Regional Climate Action Plan

Appendix H - Glossary

2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan)	The State of California's plan to reduce greenhouse gas emissions by 85 percent below 1990 levels and achieve carbon neutrality by 2045.
Active transportation/transit	Walking, biking, roller skating, using mobility devices (wheelchairs or e-bikes/scooters), and other non-motorized travel modes.
Behind-the-meter (BTM)	Refers to generating power on the customer's side of the utility meter, such as rooftop solar.
Blue carbon	Carbon captured by the world's ocean and coastal ecosystems.
Brownfield-to-brightfield projects	Deployment of clean energy (often solar) on brownfields (i.e. abandoned, underused, or idled properties, often former industrial or commercial lands, with environmental contamination from past uses).
Building decarbonization	Transitioning buildings away from gas appliances to clean electric alternatives, paired with energy efficiency.
Cap-and-Invest program	Regulation that establishes a declining limit on major sources of greenhouse gas emissions in California. The state issues a declining number of allowances (or permits) equal to the total amount of permissible emissions (or 'cap'), which decreases each year, Revenue raised through issuing allowances goes into the Greenhouse Gas Reduction Fund to support a variety of programs and projects.
Carbon neutrality	Achieved when the amount of carbon dioxide emissions (CO_2) emitted into the atmosphere is offset by an equivalent amount removed, such as through sequestration, resulting in net-zero CO_2 emissions.
Carbon sequestration	The process of removing and storing carbon dioxide from the atmosphere naturally or artificially.
Carbon sink	A system or mechanism which absorbs more carbon dioxide from the atmosphere than it releases.
Carbon stock	The amount of carbon stored in a certain "pool" such as terrestrial ecosystems (forests, grasslands, etc).

Clean energy	Zero-emissions technologies that produce electricity without emitting greenhouse gases or harmful air pollution. Renewable natural gas and biodiesel are not considered clean energy sources due to air pollution impacts of combustion. Hydrogen, depending on how it is generated and used, may or may not be considered a clean energy source.
Climate adaptation	Process by which natural and human systems adjust to a new or changing climate.
Climate action plan	A roadmap for a city, state, region, nation, organization or community that outlines actions to reduce greenhouse gas emissions and track progress toward emission reduction goals.
Climate change	Changes to the Earth's climate that affect weather, oceans, ecosystems, and global temperatures. Human activities are driving climate change, primarily through the reliance on fossil fuels to power the economy, homes, and transportation that results in emissions of billions of tons of greenhouse gases each year.
Climate resilience	The capacity for entities (individual, community, organization, or natural system) to prepare for (climate-related) disruptions, recover from (climate-related) shocks and stresses, and adapt and learn from them (BARC, paraphrased from LCI).
Cogeneration facilities	Facilities that produce electricity on-site and utilize the thermal energy, or heat, released during generation of electricity for other processes.
Community-based organization (CBO)	A nonprofit or grassroots organization entity that operates within, serves, and is accountable to a specific geographic or demographic community, focusing on addressing local social, economic, health, or civic needs through direct services, advocacy, community organizing, and resident/worker engagement (MTC).
Community Choice Aggregators (CCAs)	Electricity providers who purchase electricity on behalf of the residents and businesses in their communities. They are public entities run by a city or county government or by a joint powers authority made up of two or more participating cities or counties.

Community solar	Solar projects or purchasing programs within a specific geographic area that benefit multiple customers such as individuals, businesses, nonprofits, and other groups. Customers typically subscribe to or own a portion of a solar array and receive credits on their electric bills for the power generated by their share (DOE).
Criteria air pollutants	Six air pollutants that the Clean Air Act directs the U.S. EPA to set standards for: particulate matter, ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide and lead. These pollutants can harm human health and the environment, and cause property damage.
Decarbonization	Transitioning fossil fuel energy-using appliances, equipment, and vehicles to clean electric alternatives, paired with energy efficiency.
Demand flexibility	Solutions that adjust energy usage to match electricity supply and can shift demand from periods when electricity is more expensive, polluting, and scarce to when it is cheaper, cleaner, and more plentiful (CEC).
Distributed energy resources (DERs)	Devices and technologies that interface with the electricity system at the building level by directly connecting to a utility's wires or on a customer's property behind the utility meter. Examples include rooftop solar and battery storage, electric vehicles and their charging stations, microgrids, as well as more traditional demand response resources and energy efficiency strategies (CEC).
Distribution lines	Power lines that deliver electricity from distribution substations (where voltages are reduced) to individual customers.
Electric vehicles	Vehicles that can be powered by electric motors that draw electricity from batteries and are capable of being charged by plugging into an external electrical source.
Electrification	Transitioning gas appliances, equipment, and vehicles to electric alternatives, paired with energy efficiency.
Embodied carbon	Greenhouse gas emissions from the lifecycle of materials, from raw material extraction, manufacturing, transport, and construction, to maintenance and eventual disposal.

Emergency diesel back-up generator (BUG)	Stationary power systems that supply electricity during a power outage in commercial, industrial, and residential buildings and homes by burning diesel fuel. These units should exclusively be operated for emergency use or for reliability-related activities.
Environmental justice	This term refers to the fair treatment and meaningful involvement of people of all races, cultures, incomes, and national origins, with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (Gov. Code, § 65040.12(e)(1)). Dr. Bunyan Bryant, a pioneering environmental justice scholar, defines environmental justice as "...cultural norms and values, rules, regulations, behaviors, policies, and decisions [that] support sustainable communities where people can interact with confidence that the environment is safe, nurturing, and productive. Environmental justice is served when people can realize their highest potential … where both cultural and biological diversity are respected and highly revered and where distributive justice prevails."
Equity	In environmental justice work, equity is often defined as increasing access to power, redistributing, and providing additional resources, and eliminating barriers to opportunity to empower historically marginalized or otherwise disadvantaged communities to thrive and reach full potential (Bay Area Air District, paraphrased from the Greenlining Institute).
Feed-in tariff (FIT)	A standardized, long-term, guaranteed contract that enables smaller local renewable energy projects to sell power they generate directly to the local utility or another power provider. Market-based, cost-effective feed-in-tariffs with streamlined interconnection allow local entities, such as businesses, residents, and organizations, to install clean local energy projects in available spaces (Clean Coalition). MCE and Sonoma Clean Power currently have feed-in tariff programs.
First mile/last mile	The start or end of a trip, bridging public transit from the trip's origin and to its destination, e.g. walking to or from a bus stop.

Frontline communities	Communities who bear the brunt of the impacts from fossil fuel dependence, including poor air quality, and are often the first to experience climate impacts such as extreme heat. They may include communities of color, lower-income neighborhoods, and other historically marginalized groups and communities They are identified in the BARCAP region by using the US EPA Inflation Reduction Act Disadvantaged Communities tool and two frameworks used by Bay Area regional agencies to identify priority communities for regional planning efforts: the Assembly Bill 617 communities framework and the MTC Equity Priority Communities framework. To learn more about the data and tools used to identify frontline communities visit: BARCAP's Frontline Communities Map.
Global warming potential (GWP)	A measure of how much heat a specific greenhouse gas traps in the atmosphere, or its potential to warm the planet, relative to the same amount of CO_2. For example, over 100 years, a ton of methane produces an amount of heat equivalent to 34 tons of CO_2.
Greenhouse gas (GHG)	Gases that absorb and trap heat energy emitted from the Earth's surface, reradiating some of it back towards the surface and warming the atmosphere. Greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, halogenated fluorocarbons, ozone, perfluorocarbons, sulfur hexafluoride, and hydrofluorocarbons.
Grid-enhancing technologies	Sensors, power flow control devices, and analytical tools that maximize electricity transmission across the existing electric system or grid. They can reduce the need for new electric transmission infrastructure by increasing efficiency and capacity, and enabling the addition of clean, renewable power to the grid (DOE).
Hazardous air pollutants	Also known as toxic air contaminants, toxic air pollutants or air toxics, these pollutants may cause or contribute to an increase in mortality or in serious illness or that may pose a present or potential hazard to human health.
Heat pump space heaters	Space heating appliances that operate on electricity and use mechanical compression and evaporation (i.e. refrigerant cycle) to transfer thermal energy instead of generating heat directly by gas combustion, making them 3-5 times more efficient than natural gas options.

Heat pump water heaters	Water heaters that operate on electricity and use a refrigerant cycle to transfer heat from the surrounding air to the water instead of directly heating the water with gas combustion, making them 3-5 times more efficient than natural gas options.
Heavy-duty vehicle	Vehicles with a gross vehicle weight rating above 10,000 pounds.
Just transition	The California Workforce Development Board defines just transition as “integrated policy approaches offering protection, support, and compensation for displaced workers and communities in specific industries or regions” (CWDB).
Light-duty vehicle	Vehicles with a gross vehicle weight rating less than 8,500 pounds.
Load flexibility	Solutions that adjust load (or energy usage) to match electricity supply and can shift load or demand away from periods when electricity is expensive, polluting, and scarce to when it is cheaper, cleaner, and more plentiful (CEC).
Load shifting	The ability to shift or reduce electric demand from times of high demand (and often higher cost) and scarcity to periods of lower demand (CEC). This is often accomplished through electricity management equipment such as smart devices.
Medium-duty vehicle	Vehicles with a gross vehicle weight rating between 8,501-10,000 pounds.
Micro-grid	A small, local power system with its own power generators and distribution lines that supplies power to a specific area, such as a single building or group of buildings. It can connect to the main grid or operate as one single controllable entity independent of the main grid when necessary.
Nature-based solutions	Actions aimed at protecting, conserving, restoring, and sustainably managing natural lands and ecosystems, to address societal, economic and environmental challenges like climate change and its impacts (UNEP).
Reach code	An ordinance adopted by a local government that creates additional requirements going beyond those required by state statute.

Reconductoring	Replacing old, existing power line conductors with newer, more efficient conductors, which can increase how much electricity they can carry.
Redlining	Policies and practices that financing entities and governments deployed to segregate communities of color in “declining” neighborhoods while reserving the “best” and most “desirable” neighborhoods for white communities (Bay Area Air District, paraphrased from CalEPA).
Renewable energy	Energy produced from natural and continually replenishing resources such as sunlight, wind, water, and heat from the earth’s core (DOE).
SB 1383	California State Senate Bill 1383, the Short Lived Climate Pollutant Act, aims to reduce organic waste going to landfills by 75%, and recover and redirect 20% of currently wasted edible food to feed people.
Transmission lines	High-voltage power conductors that transmit electricity over long distances, from electricity generation sites to substations and the local power distribution system.
Transportation Demand Management (TDM)	Policies, programs, information, services, and tools to reduce single occupancy vehicle (SOV) trips by promoting public transit, carpooling, biking, walking, and flexible work schedules.
Vehicle miles traveled (VMT)	The number of miles a vehicle is driven that can be used as a metric to measure the number of miles traveled for all vehicles in a geographic region over a given time period. Annual VMT denotes the miles driven over a one-year period.
Vehicle-to-everything	Also known as bi-directional electric vehicle charging, it allows vehicle owners to use the energy stored in the electric vehicle’s battery to power homes, buildings, the wider grid, and other devices.
Virtual power plants (VPP)	Software-based system to manage distributed energy resources, such as rooftop solar, batteries, electric vehicle chargers, and appliances *(including smart thermostats, smart water heaters, smart plugs),* to support the electric grid and reduce costs to consumers. By aggregating distributed energy resources, they can help reduce the need for additional grid infrastructure and enhance local resilience.

Wildland-urban-interface (WUI)	The zone of transition between unoccupied land and human development. It is the line, area or zone where structures and other human development meet or intermingle with undeveloped wildland (FEMA).
Zero-emission vehicle (ZEV)	A vehicle that does not emit tailpipe emissions including air pollutants, toxic air contaminants, or greenhouse gas emissions.
Zero-NO_x building appliance rules	The Air District's Rules 9-4 and 9-6 that phase in requirements to reduce nitrous oxides (NO_x) from space and water heating appliances.

BARCAP Summary Response to Public Comment

The Air District received 409 comments during the public comment period. The table below summarizes major comment themes and describes how these comments were addressed. A number of comments raised issues that will best be addressed during the implementation of individual measures.

How to read the response to comments table:

- Sector – indicates which economic sector the comment addresses. Comments that address more than one sector, the planning approach, or high-level themes are labeled as "General."
- Comment Themes – summarizes the theme of similar comments that have been grouped together.
- Response – describes how comments were addressed and incorporated in the Bay Area Regional Climate Action Plan or how they will be addressed in the future.

Bay Area Regional Climate Action Plan Summary Response to Public Comments		
Sector	**Comment Themes**	**Response**
General	Include sustainable lifestyle choices such as diet changes, reduced vehicle miles traveled, and reduced consumption of goods	Added language in the Implementation chapter to emphasize the need for sustainability at all levels
General	Include people with disabilities when considering equity and access	Added language in the Introduction chapter recognizing people with disabilities and other groups at greater risk to climate change impacts
General	Include youth in outreach and education	Added language in the Implementation chapter to include youth in plan implementation and future outreach and education
General	Highlight the need for additional funding and financing opportunities	Added language in the sector chapters to emphasize the need for more funding
General	Modify the GHG emission charts, confusion around how to read	Replaced the charts in every chapter with new, easier to interpret graphics
Buildings	Acknowledge the need to grow the building decarbonization workforce, including the importance of outreach and engagement, training, and partnering with manufacturers, labor organizations, schools and colleges, need for targeted support for small and frontline contractors	Added new language to measure B-3 Additional partners including labor organizations will be considered during implementation

Buildings	Recognize obstacles to building electrification, including the lack of electrical capacity, the need for panel upgrades and installation challenges (e.g. space constraints)	Will be addressed during implementation of measure B-1
Buildings	Acknowledge need for funding/financing options for building electrification, particularly for low- to medium-income communities	Refined language in action B-1.4
Buildings	Include a concierge program for appliances, contractors, and incentives	May be considered during implementation of measure B1, depending on available funding
Buildings	Recognize the importance of public outreach and education regarding building decarbonization	Will be further considered during implementation
Buildings	Include zonal/neighborhood building decarbonization	Refined language in action B-2.3
Buildings	Include a measure or action on laws and reach codes to require or encourage building electrification	Outside of the scope of the plan, which focuses on regional actions; reach codes must be enacted at the local level
Natural and Working Lands	Incorporate concerns regarding green space access and community engagement and empowerment on green solutions	Language was refined in the NWL chapter to emphasize the importance of equity and community involvement in developing green spaces
Natural and Working Lands	Recognize importance of green infrastructure to reduce heat island effect and its impact on public health	Added more language on the threat of extreme heat in NWL sector narrative and in the climate resilience text box
Natural and Working Lands	Recommend actions around land use, removing paving, and dense in-fill housing	Added new language on removing paving in measure NWL 4 and on land use growth in the NWL chapter introduction
Natural and Working Lands	Recognize the importance of connecting with youth and schools on urban greening	Added language on the importance of youth education throughout the NWL chapter
Natural and Working Lands	Highlight the importance of coastal ecosystems and water systems as carbon sinks	Added language to measure B2 clarify and emphasize the importance of coastal and water systems
Power	Highlight the importance of enhancing energy resilience and resilience hubs	Refined the language in the power sector chapter regarding resilience
Power	Include greater adoption of solar energy projects on local properties such as schools, multifamily buildings, parking lots	Minimal language edits, language refined highlighting the important of local solar energy
Power	Acknowledge concerns regarding electricity rates and affordability	Added language in the Power sector narrative on how power sector

		measures can help apply downward pressure on rates
Power	Acknowledge concerns regarding data center energy use	Added a textbox discussing data center energy use
Power	Highlight the need to recognize storage as an important grid asset	Added language in the power sector narrative and measure co-benefits emphasizing the importance of energy storage deployment
Transportation	Kudos for the focus on frontline communities and multifamily residences for EV charging infrastructure, identified the need for more public charging infrastructure	No change needed
Transportation	Include concern regarding EV accessibility and cost	Refined language in action T-1.1
Transportation	Highlight the need for e-bike incentives and other micromobility devices	Refined language in action T-1.1
Transportation	Highlight the need for e-bike charging infrastructure and secure e-bike parking	Will be considered during implementation
Transportation	Acknowledge the importance of reducing airplane travel	Outside of the scope of the plan, which focuses on regional actions
Transportation	Acknowledge concerns regarding alternate vehicle fuels such as hydrogen fuel cells and low-carbon liquid fuels	Outside of the scope of the plan, which focuses on regional actions; requires state level action such as the Low Carbon Fuel Standard
Transportation	Include expanded and safe public transit and pedestrian, bicycle, and e-mobility infrastructure to reduce VMT and increase active transit	Added measure T-4 to support Plan Bay Area 2050+ implementation
Waste	Highlight expanded food recovery, recognizing food waste as a large emitter and highlighting the importance of addressing food waste in the near term	Refined language in the waste sector narrative and in measure W-1
Waste	Provide public education on food waste and proper organics sorting	Additional language added to action W-1 regarding priority groups for outreach such as multifamily property owners and tenants
Waste	Include durability of building materials and adaptability of building spaces	Added language to the Waste chapter highlighting the importance of durable and adaptable buildings and building materials
Waste	Support regulations and incentives to require or encourage low carbon concrete and other construction materials with low embodied GHG emissions in construction projects,	Added language to the sector narrative regarding materials with low embodied GHG emissions

	require public works projects to reduce embodied carbon, or GHG emissions associated with the lifecycle production of building materials	
Waste	Recognize concerns regarding incorrect or low code enforcement regarding building/construction requirements	Added language to emphasize the importance of code enforcement

Bay Area Air District

Update on Bay Area Regional Climate Action Plan

Policy, Grants, and Technology Committee

March 18, 2026

Jamesine Rogers Gibson
Senior Advanced Projects Advisor
Planning and Climate Protection Division

Bay Area Regional Climate Action Plan (BARCAP) Overview



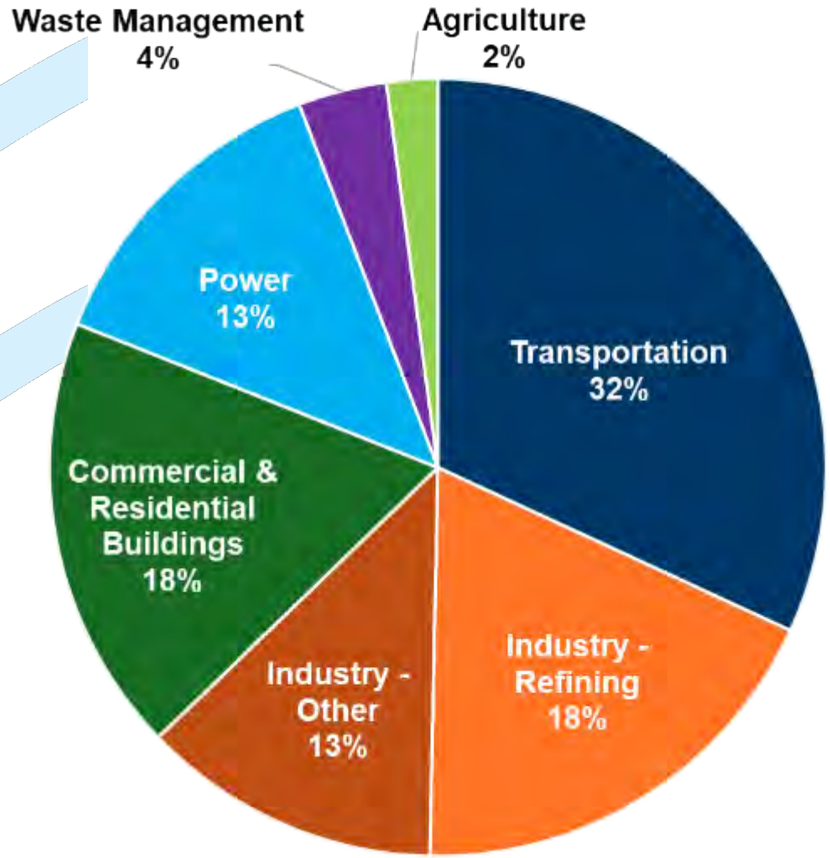
Map of the BARCAP region

- Bay Area's first regional climate action plan
- Consistent with commitments in the Air District Strategic Plan Strategy 1.7, New Climate Solutions
- Funded in part by United States Environmental Protection Agency (US EPA)

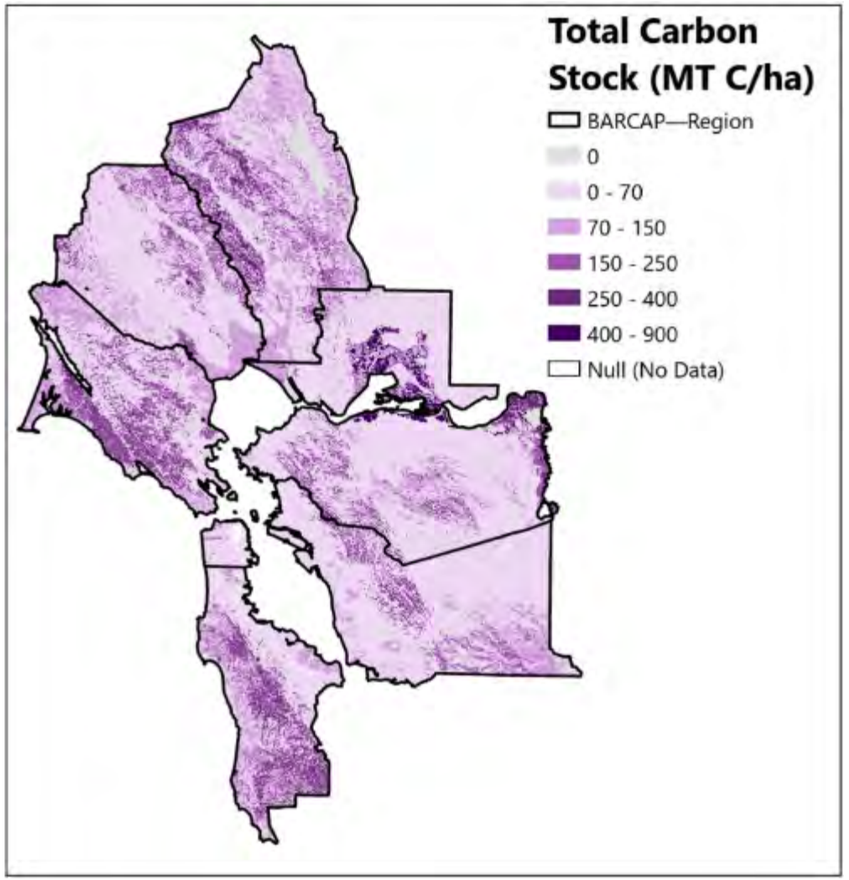
Goals of the BARCAP



BARCAP Greenhouse Gas and Carbon Stock Inventories



2022 Greenhouse Gas (GHG) Inventory for the BARCAP Region
Total of 54 Million Metric Tons of Carbon Dioxide Equivalents (MMTCO2e)



2022 Carbon Stock Inventory for the BARCAP Region
Total 92 Million Metric Tons of Carbon (MT C) Held in Plants & Soils

BARCAP Snapshot

16 Measures

57 Actions

>35 Implementers Identified



Transportation

Residential & Commercial Buildings

Electricity Generation (Power)

Waste & Materials Management

Agriculture/ Natural & Working Lands

Transportation



An individual charging an electric vehicle.

Measures:

- Accelerate light-duty electric vehicle adoption
- Accelerate medium- and heavy-duty vehicle and equipment decarbonization
- Accelerate decarbonization of goods movement
- Support implementation of Plan Bay Area 2050+

Buildings



A heat pump water heater.

Measures:

- Develop solutions for key challenges of zero-nitrogen oxides (NOx) appliance rules
- Promote healthy home retrofits by combining electrification, energy efficiency, and home repair programs
- Grow and diversify building decarbonization workforce through new initiatives and partnerships

Power



A field of solar panels.

Measures:

- Increase development of local small to medium scale clean energy and storage projects
- Expand customer programs and deploy power system and grid technologies (flexibility, resilience, and efficiency)

Waste and Materials Management



Community members at a composting workshop.

Measures:

- Enable food access and clean compost
- Advance low-carbon building materials and reuse
- Reduce methane emissions from waste management facilities

Natural and Working Lands



A redwood forest.

Measures:

- Support Nature-Based Solution Funding and Data
- Advance Conservation, Wildfire Management, and Restoration
- Accelerate Climate-Beneficial Agriculture
- Advance Environmental Justice-Centered Urban Greening

Advisory Work Group for BARCAP

































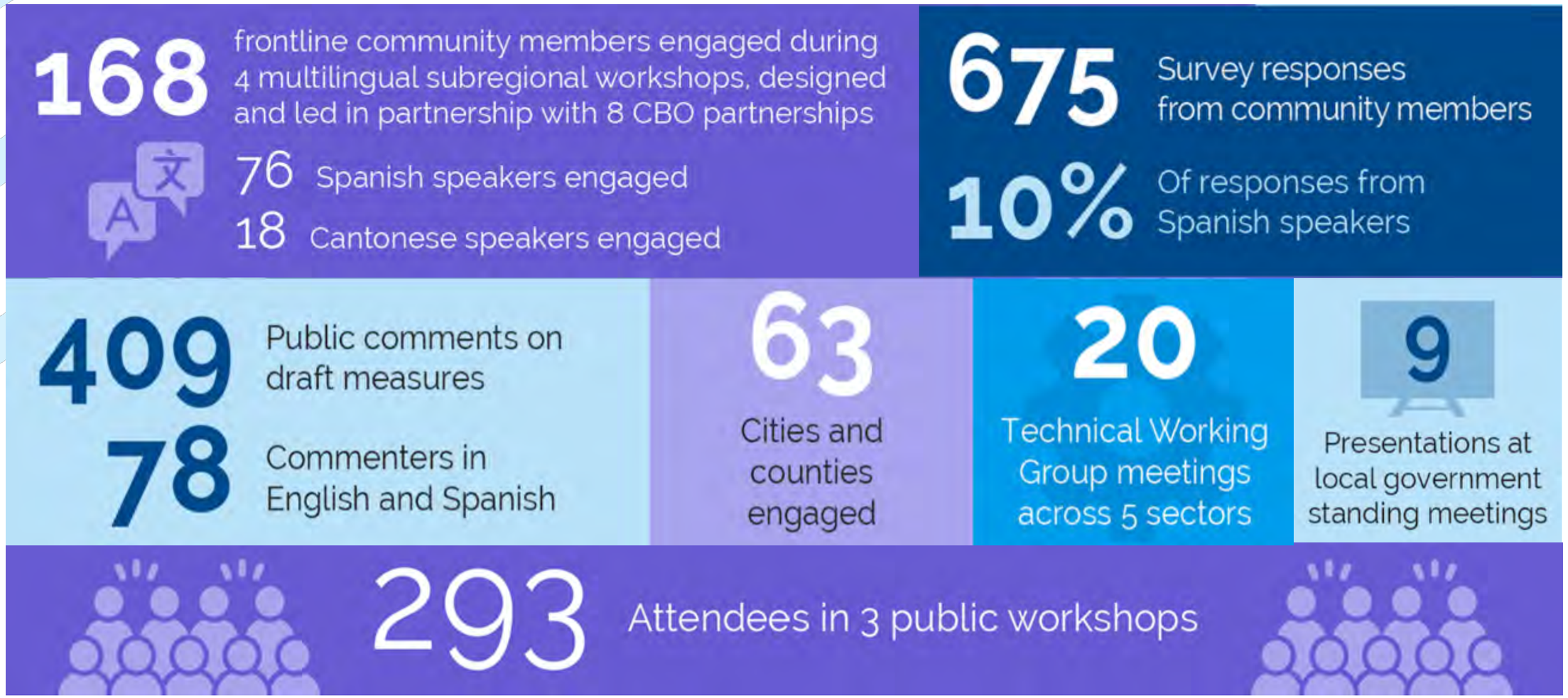


Logos of public agencies and community organizations

Logos courtesy of agency websites

Bay Area Air District

BARCAP Engagement Highlights



BARCAP Deliverables Benefit the Region



Regional GHG Inventory (Dashboard)

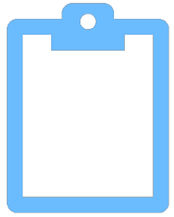


Regional Carbon Stock Inventory

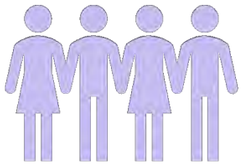




Workforce Planning Analysis



Public Survey Results



Frontline Communities Impacts Analysis

Sample Funding Roadmap



Pathways highlighted in darker gray are particularly applicable and/or accessible to the Bay Area Community

** Indicates a pathway may Involve Residential & Commercial Costs*

*** Pathway cancelation currently under dispute or may not have future funding*

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Bay Area Air District

Air District Role in Implementation

- Serve as lead or supporting implementer for specific actions
  - *Regulations, funding, other*
- Track progress
- Play key overarching role in support of implementation



Puzzle pieces joining together in a circle

Next Steps



Hand holding a magnifying glass showing city lights

- Meet with other lead implementers
- Set up framework for tracking progress
- Update Board on implementation periodically

Santa Clara County

- Santa Clara County received a $1 million grant from the US EPA to develop a Comprehensive Climate Action Plan with San Benito County
- Santa Clara County and the Air District have been coordinating throughout the development of their climate plans



Santa Clara County logo

Questions & Discussion

For more information:

Jamesine Rogers Gibson | Senior Advanced Projects Advisor | jrogersgibson@baaqmd.gov

Abby Young | Manager, Climate Solutions | ayoung@baaqmd.gov