California Air Resources Board

Discussion Draft

2030 Target Scoping Plan Update

December 2, 2016

The California Air Resources Board (ARB or Board) kicked off development of the 2030 Target Scoping Plan in October 2015 in coordination with other State agencies and has since been soliciting feedback and comments from a team of economic advisors, local air districts, community members, affected stakeholders, and the AB 32 Environmental Justice Advisory Committee at public meetings throughout the State.

This 2030 Target Scoping Plan Discussion Draft (Discussion Draft) provides ARB staff's current thoughts on how to achieve the State's SB 32 climate goal of reducing greenhouse gases by at least 40 percent below 1990 levels by 2030. The draft 2030 Target Scoping Plan Scenario and alternatives included in the Discussion Draft are based on materials presented at previous 2030 Target Scoping Plan workshops and ARB Board meetings. The Discussion Draft is not the complete 2030 Target Scoping Plan. Some analyses, such as those newly required by AB 197, and economic and environmental analyses, are not included at this time. The intent of this Discussion Draft is to elicit feedback and to help refine the overall approach and strategies to be analyzed for achieving the 2030 target. Comments received on this Discussion Draft will inform the development of a comprehensive Proposed 2030 Target Scoping Plan (January Proposed Scoping Plan) that ARB expects to release in January 2017 for public review. The January Proposed Scoping Plan will include the full environmental analysis, economic analysis, AB 197 analyses, and supporting technical appendices.

ARB welcomes broad participation from stakeholders, experts, and interested parties throughout this process. Comments from stakeholders on this document are requested by December 16, 2016 at 5:00 PM PST.

Comments can be submitted here: *www.arb.ca.gov/cc/scopingplan/scopingplan.htm*

The tentative schedule for development of the 2030 Target Scoping Plan and public engagement is provided in the table below.

Estimated Timeline and Process for Developing the 2030 Target Scoping Plan

Mid-December 2016	Public workshop on Draft Scoping Plan
Early January 2017	Release January Proposed 2030 Target Scoping Plan for 45-day public comment
Late January 2017	Public Hearing to present January Proposed 2030 Target Scoping Plan to Board
Spring 2017	Release Spring Proposed 2030 Target Scoping Plan
Spring 2017	Public Hearing to present Spring Proposed 2030 Target Scoping Plan to Board for approval

California Air Resources Board

Additional material related to the development of the 2030 Target Scoping Plan is posted in ARB's climate change website at: www.arb.ca.gov/cc/scopingplan/scopingplan.htm

Table of Contents

Executive Summary – JANUARY 2017

Preface

California has made significant progress toward our climate goals. Greenhouse gas emissions are approximately 35 million metric tons of CO_2 equivalents ($MMTCO_2e$) lower than in 2006, the year Assembly Bill 32 (AB 32, Chapter 488, Statutes of 2006) was enacted. Numerous regulatory and incentive programs have been developed and implemented while the economy has continued to grow. However, despite California's marked progress, greater innovation and effort is needed to avoid the worst consequences of climate change. The State's 2050 goal to reduce greenhouse gas (GHG) emissions to 80 percent below 1990 levels is consistent with an Intergovernmental Panel on Climate Change analysis of the trajectory that would stabilize atmospheric GHG concentrations at 450 parts per million carbon dioxide equivalent and reduce the likelihood of catastrophic climate change. Continuing progress to this long-term goal requires California to maintain and build upon existing programs, scale up deployment of clean technology, and provide more low-carbon options to accelerate GHG emission reductions, especially after 2020. The State must continue to progress toward efficient clean energy in every sector of the economy and capitalize on new opportunities to value and integrate natural and working lands into a comprehensive climate policy framework.

The First Update to the AB 32 Climate Change Scoping Plan (First Update) was adopted by the California Air Resources Board (ARB or Board) in 2014 and defined the State's climate change priorities for the next five years and laid the groundwork to start the transition to the post-2020 goals set forth in Executive Orders S-3-05 and B-16-2012. The First Update recommended the need for a 2030 mid-term GHG target to establish a continuum of action to reduce emissions. While the First Update identified sector-specific actions, it stopped short of identifying the detailed suite of strategies, along with estimated emission reductions, cost projections, and a schedule for adoption.

Following on that trajectory, in April 2015, Governor Edmund G. Brown issued Executive Order B-30-15 to establish a California GHG reduction target of 40 percent below 1990 levels by 2030. In doing so, the Governor called on California to pursue a new and ambitious set of strategies, in line with the five climate change pillars from his inaugural address to reduce GHG emissions and prepare for the unavoidable impacts of climate change. In order to develop a clear plan of action to achieve the State's goals, the Executive Order called on ARB to update the AB 32 Climate Change Scoping Plan to incorporate the 2030 target. In Summer 2016, the Legislature affirmed the importance of addressing climate change through passage of Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016), which codified into statute the target of 40 percent below 1990 levels by 2030 contained in the Governor's Executive Order. The update to the AB 32 Climate Change Scoping Plan to reflect the 2030 target (2030 Target Scoping Plan) will serve as the framework to define the State's climate change priorities for the next 14 years and beyond.

I. Introduction

A. Background

In November 2016, California Governor Edmund G. Brown affirmed California's role in the United States, noting that "We will protect the precious rights of our people and continue to confront the existential threat of our time — devastating climate change." By working to reduce the threat facing the State and setting an example for other jurisdictions that aim to take action, California continues to lead in the climate arena. The 2030 Target Scoping Plan identifies several alternatives that would allow the State to build upon its legacy of climate leadership, reach our 2030 climate goals, and substantially advance our 2050 climate goals. By selecting and pursuing a sustainable and clean economy path for 2030, the State will continue to successfully execute existing programs, demonstrate the coupling of economic growth and environmental progress, and enhance new opportunities for engagement within the State to address and prepare for climate change.

1. Climate Legislation and Directives

California has made progress on addressing climate change during periods of both Republican and Democratic national administrations. California Governors and the Legislature have taken bold steps to ensure the State's leadership and commitment to improving public health and the environment are always a priority. A series of executive orders and laws generated policies and actions across State government, among local and regional governments, and within industry; these policies also allowed for collaboration with Federal agencies and spurred partnerships with many jurisdictions beyond California's borders. The State has been consistent and valiant in its efforts to address climate change and serve as an example of how other regions can take similar action in reducing greenhouse gas (GHG) emissions. Moving forward, California will continue in its pursuit of collaborations and advocacy for action to address climate change.

Assembly Bill 32: California's Global Warming Solutions Act

Assembly Bill 32 (AB 32), the California Global Warming Solutions Act of 2006 (Nunez, Chapter 488, Statutes of 2006), represented a defining moment in California's long history of environmental stewardship and secured the State's role as a leader in reducing GHGs. In response to AB 32, California began to address climate change by employing a comprehensive, long-term approach to cut the State's GHG emissions to 1990 levels by 2020 and to maintain and continue reductions post 2020.

Pursuant to AB 32, the Scoping Plan must "*identify and make recommendations on direct emission reduction measures, alternative compliance mechanisms, market-based compliance mechanisms, and potential monetary and nonmonetary incentives*" in order to achieve the 2020 goal, and achieve "*the maximum technologically feasible and cost-*

effective GHG emission reductions" by 2020 and maintain and continue reductions beyond 2020.

Executive Order B-30-15

In his January 2015 inaugural address, Governor Brown identified five key climate change strategy "pillars," which recognize that several major areas of the California economy will need to reduce their emissions to meet California's ambitious climate change goals. These five pillars are:

1. Reducing today's petroleum use in cars and trucks by up to 50 percent;
2. Increasing from one-third to 50 percent our electricity derived from renewable sources;
3. Doubling the efficiency savings achieved at existing buildings and making heating fuels cleaner;
4. Reducing the release of methane, black carbon, and other short-lived climate pollutants; and
5. Managing farm and rangelands, forests and wetlands so they can store carbon.

Consistent with these goals, Governor Brown signed Executive Order B-30-15 in April 2015 establishing a California GHG reduction target of 40 percent below 1990 levels by 2030. Executive Order B-30-15 also calls on ARB, in coordination with sister agencies, to update the AB 32 Climate Change Scoping Plan to incorporate the 2030 target.

Senate Bill 350: Golden State Standards

The passage of Senate Bill 350 (SB 350) (De Leon, Chapter 547, Statutes of 2015), Golden State Standards requires the State to set GHG reduction planning targets both for the electricity sector as a whole and for individual utilities and other electricity providers (collectively known as load serving entities), which will develop strategies to reduce GHG emissions through Integrated Resource Planning. The bill also codified an increase in the RPS to 50 percent by 2030[1] and doubling of energy savings in electricity and natural gas end uses as discussed in the Governor's inaugural address. By enacting these two complementary targets into law, SB 350 aims to create jobs, grow the State's economy, and improve public health by setting new renewable energy standards for California's RPS and increasing energy efficiency, and focusing long-term resource planning on reducing GHG emissions.[2]

Senate Bill 32: California Global Warming Solutions Act of 2016: emissions limit & Assembly Bill 197: State Air Resources Board: greenhouse gases: regulations.

In Summer 2016, the Legislature passed and the Governor signed Senate Bill 32 (SB 32) (Pavley, Chapter 249, Statutes of 2016) and Assembly Bill 197 (AB 197) (Garcia, Chapter 250, Statutes of 2016). SB 32 affirms the importance of addressing

[1] As codified under SB 2, the current RPS is 33 percent by the year 2020. Renewable procurement status percentages for the State's largest investor owned utilities can be found at: www.cpuc.ca.gov/RPSHomepage/.
[2] SB 350: Golden State Standards. Available at: focus.senate.ca.gov/sites/focus.senate.ca.gov/files/climate/505050.html

climate change by codifying into statute the GHG emissions reductions target of at least 40 percent below 1990 levels by 2030 contained in Governor Brown's April 2015 Executive Order B-30-15. SB 32 builds on Assembly Bill 32. SB 32 keeps us on the path toward achieving the State's 2050 objective of reducing emissions to 80 percent below 1990 levels, consistent with an Intergovernmental Panel on Climate Change (IPCC) analysis of the emissions trajectory that would stabilize atmospheric GHG concentrations at 450 parts per million carbon dioxide equivalent (CO_2e) and reduce the likelihood of catastrophic impacts from climate change.

The accompanying bill to SB 32, AB 197, provides additional direction to the ARB on the following areas related to the adoption of strategies to reduce GHG emissions. Additional direction in AB 197 is meant to provide easier public access to air emissions data that is collected by ARB:

- It requires annual posting of GHG, criteria, and toxic air contaminants data throughout the State broken down to the local and sub-county level for stationary sources and to at least a county level for mobile sources. Separate from the development of the 2030 Target Scoping Plan, ARB has begun the process to implement this provision of AB 197.
- When adopting rules and regulations to achieve emissions reductions to protect the State's most impacted and disadvantaged communities, ARB shall consider the social costs of the emissions of GHGs, and prioritize both of the following:
    - Emission reduction rules and regulations that result in direct emission reductions at large stationary sources of GHG emissions sources and direct emission reductions from mobile sources.
    - Emission reduction rules and regulations that result in direct emission reductions from sources other than those listed above.
- In the development of each scoping plan, AB 197 also directs ARB to identify for each emissions reduction measure, including each alternative compliance mechanism, market-based compliance mechanism, and potential monetary and nonmonetary incentive the following information:
    - The range of projected GHG emissions reductions that result from the measure.
    - The range of projected air pollution reductions that result from the measure.
    - The cost-effectiveness, including avoided social costs, of the measure.

AB 197 does not identify or preclude any specific mechanisms for achieving the 2030 GHG emissions reductions target. The 2030 Target Scoping Plan reflects the direction provided in AB 32, SB 32 and AB 197.

Senate Bill 1383: Short-lived climate pollutants: methane emissions: dairy and livestock: organic waste: landfills.

Senate Bill 1383 (SB 1383) (Lara, Chapter 395, Statutes of 2016) requires the development, adoption, and implementation of a Short-Lived Climate Pollutant

Strategy.[3,4] Short-lived climate pollutants, such as black carbon, fluorinated gases, and methane, are powerful climate forcers that have a dramatic and detrimental effect on air quality, public health, and climate change. These pollutants create a warming influence on the climate that is many times more potent than that of carbon dioxide. The State has already issued a Proposed Short-Lived Climate Pollutant Reduction Strategy (Proposed SLCP Strategy), which establishes a path to decrease GHG emissions and displace fossil-based natural gas use. This includes deploying widely available technologies to avoid landfill methane emissions by reducing the disposal of organics, and recovering methane from wastewater treatment facilities, and manure at dairies, and use the methane as a renewable source of natural gas to fuel vehicles or generate electricity. The Proposed SLCP Strategy also identifies steps to reduce natural gas leaks from oil and gas wells, pipelines, valves, and pumps to improve safety, avoid energy losses, and reduce methane emissions associated with natural gas use.
SB 1383 includes the following specific goals for 2030 from 2013 levels:

- 40 percent reduction in methane,
- 40 percent reduction in hydrofluorocarbon gases, and
- 50 percent reduction in anthropogenic black carbon.[5]

ARB released a revised Proposed SLCP Strategy in late November 2016 that reflects the direction in SB 1383.

2. Initial Scoping Plan and First Update to the Scoping Plan

The Initial Scoping Plan[6] in 2008 presented the first economy-wide approach to reducing emissions, and highlighted the value of combining both carbon pricing with other complementary programs to achieve the most cost-effective emission reduction strategies for the State through 2020. The coordinated set of policies in the Initial Scoping Plan employed strategies tailored to specific needs, including market-based compliance mechanisms, performance standards, technology requirements, and voluntary reductions. The Initial Scoping Plan also described a conceptual design for a cap-and-trade program that included eventual linkage to other cap-and-trade programs to form a larger regional trading program.

AB 32 requires ARB to update the scoping plan at least every five years. The First Update to the Scoping Plan[7] (First Update), approved in 2014, presented an update on the program and its progress toward meeting the 2020 limit, as well as developed the first vision for the long-term progress that the State endeavors to achieve. In doing so, the First Update laid the groundwork to start the transition to the post-2020 goals set forth in Executive Orders S-3-05 and B-16-2012. It also recommended the need for a

[3] www.arb.ca.gov/cc/shortlived/shortlived.htm
[4] leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB605
[5] leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1383
[6] ARB, Initial AB 32 Climate Change Scoping Plan. Available at: www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf
[7] ARB. First Update to the AB 32 Scoping Plan. Available at: www.arb.ca.gov/cc/scopingplan/document/updatedscopingplan2013.htm

2030 mid-term target to establish a continuum of actions to maintain and continue reductions rather than only focusing on targets for 2020 or 2050.

3. Building on California's Environmental Legacy

California's successful climate policies and programs have already delivered emission reductions resulting from cleaner, more fuel-efficient cars and zero emission vehicles (ZEVs), cleaner low-carbon fuels, more renewable energy, greater waste diversion from landfills, water conservation, and additional actions to improve the energy efficiency of homes and businesses. These policies and programs have also improved public health, created green jobs, and given consumers more clean energy choices. The 2030 GHG emissions reduction target in SB 32 will ensure that the State maintains this momentum beyond 2020. The 2030 Target Scoping Plan lays out a path to simultaneously make progress on the State's climate goals and air quality improvement in all parts of the State.

Moving forward, California's climate strategy will require contributions from all sectors of the economy and will include enhanced focus on zero- and near-zero emission (ZE/NZE) vehicle technologies; continued investment in renewables including solar roofs, wind, and other distributed generation; greater use of low-carbon fuels; integrated land conservation and development strategies; and coordinated efforts to reduce emissions of short-lived climate pollutants (methane, black carbon and fluorinated gases); and an increased focus on integrated land use planning, to support livable, transit-connected communities and conservation of agricultural and other lands. Requirements for direct GHG reductions at refineries will further support air quality co-benefits in neighborhoods, including in disadvantaged communities historically located adjacent to these large stationary sources, as well as efforts with local air districts to tighten emission limits on a broad spectrum of industrial sources. Preliminary analysis indicates that continuing the Cap-and-Trade Program would provide compliance flexibility as the lowest cost GHG emission reductions would be undertaken first, with opportunities to collaborate with other regions and achieve even greater GHG emission reductions. Further, funds collected through the Cap-and Trade Program in the Greenhouse Gas Reduction Fund (GGRF) can contribute to residents in disadvantaged communities having equitable access to clean technology, clean energy options, transit options, and infrastructure improvements that reduce GHGs and improve quality of life.

4. Purpose of the 2030 Target Scoping Plan Update

The 2030 limit puts California on the path to meeting the 2050 GHG emission reduction goal. However, the State's long-term climate goal can only be achieved by employing an appropriate and coordinated policy framework. The 2030 Target Scoping Plan incorporates and leverages many existing and ongoing efforts while identifying new policies to progress towards the State's climate and air quality goals.

The actions identified in the 2030 Target Scoping Plan can reduce overall GHG emissions in California, and deliver strong policy signals that will continue to drive

investment and certainty in a low-carbon economy. The 2030 Target Scoping Plan builds upon the successful framework established by the Initial Scoping Plan and First Update, while also identifying new, technological feasibility and cost-effective strategies to ensure that California meets its GHG reduction targets in a way that promotes and rewards innovation, continues to foster economic growth, and delivers improvements to the environment and public health, including in disadvantaged communities. The 2030 Target Scoping Plan is developed to be consistent with requirements set forth in SB 32 and AB 197. Each of the proposed scenarios includes policies to require direct GHG reductions at some of the State's largest stationary sources and mobile sources. These policies include the use of lower GHG fuels, efficiency regulations, and the Cap-and-Trade Program, which constrains and reduces emissions at covered sources.

5. Process for Developing the 2030 Target Scoping Plan Update

This plan is being developed in an open and transparent manner, involving coordination with State agencies, engagement with the Legislature, and the opportunity for stakeholders and the public to engage in the process through workshops and other meetings. This plan was developed in close coordination with other State agency plans and regulations, including the Cap-and-Trade Regulation, the Low Carbon Fuel Standard (LCFS), the State Implementation Plan, the California Sustainable Freight Action Plan, California Transportation Plan 2040, the Forest Carbon Plan, and the Short-Lived Climate Pollutant Strategy, among others.

To date, ARB, in collaboration with the Governor's Office and other State agencies, has solicited comments and feedback from affected stakeholders and the Environmental Justice Advisory Committee (EJAC) that has informed the 2030 Target Scoping Plan. Below is a list of the public workshops and symposia where the development of the 2030 Target Scoping Plan has been discussed:

- Governor's Office Pillar Symposia – 2030 Climate Change Commitments
    - August 5, 2015: Natural and Working Lands Symposium
    - July 8, 2015: Symposium to Discuss Cutting Petroleum Use in Half by 2030
    - July 9, 2015: Renewables Symposium
- October 1, 2015: Kickoff Public Workshop on the Draft Scoping Plan Update to Reflect 2030 Target
- November 19, 2015: Board Hearing Informational Presentation on Status of the Draft 2030 Target Scoping Plan
- December 7, 2015: First Meeting of the EJAC to Inform Development of the Draft 2030 Target Scoping Plan
- January 15, 2016: Draft Scoping Plan Economic Analysis Workshop
- March 23, 2016: Public Workshop on the Natural and Working Lands Sector to Inform Development of the Draft 2030 Target Scoping Plan
- April 27, 2016: Public Workshop on the Agriculture Sector to Inform Development of the Draft 2030 Target Scoping Plan

- June 23, 2016: Board Hearing Informational Presentation on Status of the Draft 2030 Target Scoping Plan
- August 23, 2016: Public Workshop on the Energy Sector to Inform Development of the Draft 2030 Target Scoping Plan
- September 14, 2016: Public Workshop on the Transportation Sector to Inform Development of the Draft 2030 Target Scoping Plan
- November 7, 2016: Public Workshop on 2030 Target Scoping Plan: Greenhouse Gas Reduction Policy Scenarios, Natural & Working Lands, Local Action, and Public Health Analysis
- November 17, 2016: Board Hearing Informational Presentation on Status of the Draft 2030 Target Scoping Plan
- Details on additional EJAC, Community Meetings, and the EJAC's Initial Recommendations are provided in section I-D.5.

One key message that came across from engagement with the Legislature, EJAC, and environmental justice communities was the need to place more emphasis on large stationary sources with a particular focus on multi-pollutant strategies for these sources that reduce GHGs and harmful criteria and toxic air pollutants that result in localized health impacts, especially in disadvantaged communities. Another consistent message was the need for infrastructure and other community improvements that enhance quality of life, increase access to safe and viable transportation options, and improve physical activity and related health outcomes.

B. Updated Climate Science Supports the Need for More Action

Climate scientists agree that global warming trends and other shifts in the climate system observed over the past century are caused by human activities. These changes are proceeding at an unprecedented rate when compared with climate change that human society has lived through to date.[8] According to new research, unabated GHG emissions could allow sea levels to rise close to two meters in total (more than six feet) by the end of this century – nearly twice as much as previously predicted – an outcome that could devastate coastal communities in California and around the globe.[9]

California is already feeling the effects of climate change, and projections show that these will continue and worsen over the coming centuries. The impacts of climate change have been reported by the Office of Environmental Health Hazard Assessment (OEHHA) in the climate change indicators report, which includes the following changes:[10]

[8] Cook, J., et al. (2016) Consensus on consensus: a synthesis of consensus estimates on human-caused global warming, *Environmental Research Letters*, 11:048002 doi:10.1088/1748-9326/11/4/048002. iopscience.iop.org/article/10.1088/1748-9326/11/4/048002.
[9] DeConto, R.M., and D. Pollard (2016) Contribution of Antarctica to past and future sea-level rise, *Nature,* 531:591–597, doi:10.1038/nature17145.
[10] Office of Environmental Health Hazard Assessment, Indicators of Climate Change (website): oehha.ca.gov/climate-change/document/indicators-climate-change-california

- Recorded increase in annual average temperatures, as well as increases in daily minimum and maximum temperatures,
- An increase in the occurrence of extreme events, including wildfire and heat waves,
- Reduction in Spring runoff volumes, as a result of declining snowpack,
- A decrease in Winter chill hours, necessary for the production of high-value fruit and nut crops, and
- Changes in the timing and location of species sightings, including migration upslope of flora and fauna, and earlier appearance of Central Valley butterflies.

In addition to these trends, the State's current conditions point to a changing climate. California is in the middle of an historic drought. Recent scientific studies show that such extreme drought conditions are more likely to occur under a changing climate.[11,12] The total statewide economic cost of the 2013–2014 drought was estimated at $2.2 billion, with a total loss of 17,100 jobs.[13] In the Central Valley, the current drought has cost California agriculture about $2.7 billion and more than 20,000 jobs in 2015 which highlights the critical need for developing drought resilience, even if wet conditions mitigate the current drought.[14] Drought affects other sectors as well. An analysis of the amount of water consumed in meeting California's energy needs between 1990 and 2012 shows that while California's energy policies have supported climate mitigation efforts, they have increased vulnerability to climate impacts, especially greater hydrologic uncertainty.[15]

California has always been drought-prone, but the severity of this current drought – 2013 was the driest year on record for the State, 2014 was the fourth driest, while 2015 was the warmest year on record – have led many to wonder whether global warming may be a contributing factor. Hence, several recent publications carefully examined the potential role for climate change in the California drought. One study examined both precipitation and runoff in the Sacramento and San Joaquin River basins, and found that 10 of the past 14 years have been below normal, and the past three years have been the driest and hottest in the full instrumental record from 1895 through November 2014.[16] In another study, the authors show that the increasing co-occurrence of dry years with warm years raises the risk of drought, highlighting the critical role of elevated temperatures in altering water availability and increasing overall drought intensity and impact.[17] Generally, there is growing risk of

[11] Diffenbaugh, N., D.L. Swain, and D. Touma. 2015. Anthropogenic Warming has Increased Drought Risk in California. *Proceedings of the National Academy of Sciences* 112(13): 3931-3936.
[12] Cayan, D, T. Das, D.W. Pierce, T.P. Barnett, M. Tyree, and A. Gershunov. 2010. Future Dryness in the Southwest US and Hydrology of the Early 21st Century Drought. *Proceedings of the National Academy of Sciences* 107(50): 21272-21276.
[13] Howitt, R., J. Medellin-Azuara, D. MacEwan, J. Lund, and D. Summer (2014) Economic Impacts of 2014 Drought on California Agriculture. watershed.ucdavis.edu/files/biblio/DroughtReport_23July2014_0.pdf.
[14] Williams, A.P., et al. (2015) Contribution of anthropogenic warming to California drought during 2012–2014, *Geophysical Research Letters*, doi:onlinelibrary.wiley.com/doi/10.1002/2015GL064924/abstract.
[15] Fulton, J., and H. Cooley (2015) The water footprint of California's energy system, 1990–2012, *Environmental Science & Technology*, 49(6):3314–3321. pubs.acs.org/doi/abs/10.1021/es505034x.
[16] Mann, M.E., and P.H. Gleick (2015) Climate change and California drought in the 21st century, Proceedings of the National Academy of Sciences of the United States of America, 112(13):3858-3859. doi.org/10.1073/pnas.1503667112.
[17] Diffenbaugh, N.S., D.L. Swain, and D. Touma (2015) Anthropogenic warming has increased drought risk in California, Proceedings of the National Academy of Sciences of the United States of America, 10.1073/pnas.1422385112. www.pnas.org/content/112/13/3931.full.pdf

unprecedented drought in the western United States driven primarily by rising temperatures, regardless of whether or not there is a clear trend in precipitation.[18]

According to the U.S. Forest Service "National Insect and Disease Forest Risk Assessment, 2013-2027," (Krist et al., 2012) California is at risk of losing at least 25 percent of standing live forest due to insects and disease over 5.7 million acres, or 12 percent of the total forested area in the State. Some species are expected to lose significant amounts of their total basal area (i.e., whitebark pine projected to lose 60 percent of basal area, lodgepole pine 40 percent). While future climate change is not modeled within the risk assessment, and current drought conditions are not accounted for in these estimates, the projected climate changes over the next 15 years are expected to significantly increase the number of acres at risk, and will increase the risk from already highly destructive pests such as mountain pine beetle. Extensive tree mortality is already prevalent in California. The western pine beetle and other bark beetles have killed a majority of the ponderosa pine in the foothills of the central and southern Sierra Nevada Mountains. A recent aerial survey by the U.S. Forest Service identified more than 100 million dead trees in California (www.usda.gov/wps/portal/usda/usdahome?contentid=2016/11/0246.xml&contentidonly=true). As there is usually a lag time between drought years and tree mortality, we are now beginning to see a sharp rise in mortality from the past four years of drought. In response to the very high levels of tree mortality concentrated there, Governor Jerry Brown issued an Emergency Proclamation on October 30, 2015.

A warming climate also causes sea level to rise; first, by warming the oceans which causes the water to expand, and second, by melting land ice which transfers water to the ocean. Even if storms do not become more intense and/or frequent, sea level rise itself will magnify the adverse impact of any storm surge and high waves on the California coast. Some observational studies report that the largest waves are already getting higher and winds are getting stronger.[19] The ocean is also changing as temperatures warm and GHG concentrations increase. Carbon dioxide is dissolving in the ocean, making it more acidic. More acidic ocean water impacts a wide variety of marine species, including species that people use for food. This fundamental change is likely to have substantial ecological and economic consequences for California and worldwide. [20]

A growing body of scientific evidence also shows that healthy tropical forests are central to solving climate change as tropical forests exchange large amounts of water and energy with the atmosphere (effecting atmospheric rivers), controlling regional and global climate. Atmospheric rivers are relatively narrow regions in the atmosphere that are responsible for most of the horizontal transport of water vapor outside of the tropics. Deforestation and climate change have the capacity to alter

[18] Cook, B.I., T.R. Ault, and J.E. Smerdon (2015) Unprecedented 21st century drought risk in the American Southwest and Central Plains, *Science Advances*, 1(1), e1400082, doi:10.1126/sciadv.1400082.
[19] National Research Council of the National Academy of Sciences (2012) Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future, National Academies Press.
[20] Chan, F., et al. (2016) The West Coast Ocean Acidification and Hypoxia Science Panel: Major Findings, Recommendations, and Actions. California Ocean Science Trust, Oakland, California, USA.

rainfall regimes, water availability, and surface-atmosphere flux of water and energy of tropical forests. Between 2010 and 2015, despite some successful efforts at reducing the global rate of deforestation, trends continued to show losses of upwards of 6.6 million hectares per year, mainly from loss of natural forests in the tropics. Tropical deforestation accounts for about 15 percent of global GHG emissions – larger than the entire global transportation sector. Preserving the tropical forests will help meet the aggressive emissions reduction targets that are necessary to avoid catastrophic climate change and may help to preserve California's historical rainfall patterns.

While more intense dry periods are anticipated under warmer conditions, extremes on the wet end of the spectrum are also expected to increase, due to more frequent warm, wet "atmospheric river" events and a higher proportion of precipitation falling as rain instead of snow. Atmospheric rivers have, in recent years, been recognized as the cause of the large majority of major floods in rivers all along the U.S. West Coast and as the source of 30-50 percent of all precipitation in the same region.[21] These extreme precipitation events, together with the rising snowline, often cause devastating floods in major river basins (e.g., California's Russian River). It was estimated that the top 50 observed floods in the U.S. Pacific Northwest were due to atmospheric rivers.[22] Looking ahead, computer models predict that climate change will cause the very worst atmospheric river storms hitting California to become much more frequent and larger.

Sea level rise, droughts, floods, and forest impacts are just some of the environmental systems disrupted by climate change. As GHG emissions continue to accumulate and climate disruption grows, such destructive events will become more frequent. The historical record, which once set our expectations for the traditional range of weather and other natural events, is becoming an increasingly unreliable predictor of the conditions we will face in the future. Climate disruption can drive extreme weather events such as coastal storm surges, drought, wildfires, floods, and heat waves. Effective climate policy must be based in the best available science, so California is committed to further supporting new research on ways to mitigate climate change as well as how to understand its ongoing and projected impacts. California's Fourth Climate Change Assessment further updates our understanding of the many impacts from climate change in a way that directly informs State agencies' efforts to safeguard the State's people, economy, and environment.

Together, current conditions and future projections provide a picture of California's changing climate, with two important messages:

- Change is already being experienced and documented across California, and some of these changes have been directly linked to changing climatic conditions.

[21] Dettinger, M.D. (2013) Atmospheric rivers as drought busters on the U.S. West Coast, *Journal of Hydrometeorology*, 14:1721-1732, doi:10.1175/JHM-D-13-02.1. journals.ametsoc.org/doi/abs/10.1175/JHM-D-13-02.1.
[22] Warner, M.D., C.F. Mass, and E.P. Salath´e (2012) Wintertime extreme precipitation events along the Pacific Northwest coast: climatology and synoptic evolution, *Monthly Weather Review*, 140:2021-43. journals.ametsoc.org/doi/abs/10.1175/MWR-D-11-00197.

- Even with the uncertainty in future climate conditions, every scenario estimates further change in future conditions.

It is critical that California continue to take steps to reduce GHG emissions in order to avoid the worst of the projected impacts of climate change. At the same time, the State is taking steps to make the State more resilient in the face of a changing climate. California's efforts are vital steps toward minimizing the impact of GHG emissions and can serve as a model for action.

C. California's Greenhouse Gas Emissions and the 2030 Target

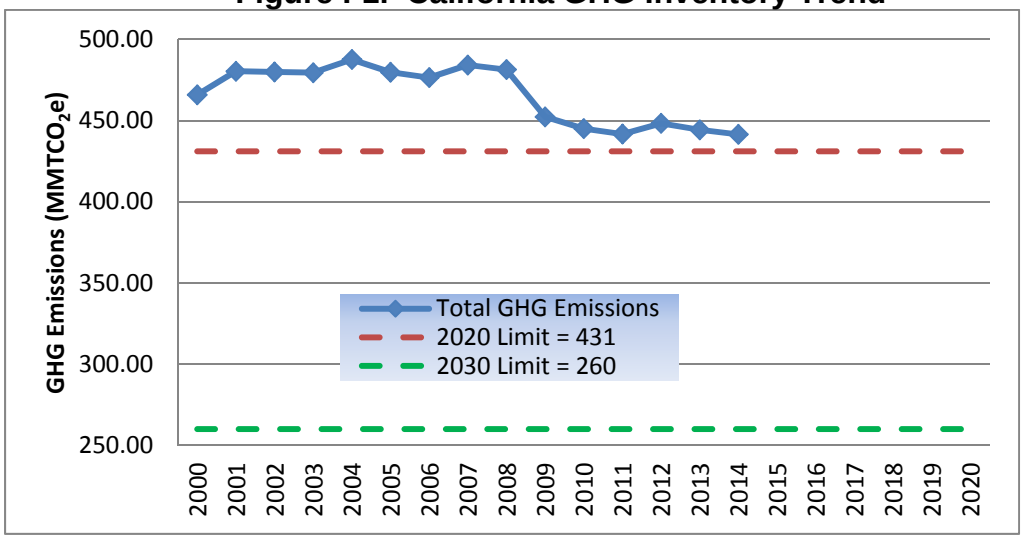
1. Progress Toward Achieving the 2020 Limit

California has made progress toward achieving the 2020 statewide GHG target while also reducing criteria pollutants and toxic air contaminants and supporting economic growth. As shown in Figure I-1, in 2014, total GHG emissions decreased by 2.8 million metric tons of CO_2 equivalents ($MMTCO_2e$) compared to 2013, representing an overall decrease of 9.4 percent since peak levels in 2004. The 2014 GHG Emission Inventory and a description of the methodology updates can be accessed here: www.arb.ca.gov/cc/inventory/inventory.htm

AB 32 gives ARB the role of developing and tracking GHG emissions and progress toward the target. California Health and Safety Code section 38505 identifies seven GHGs that ARB is responsible for monitoring and regulating in order to reduce emissions: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and nitrogen trifluoride (NF_3). The fluorinated gases are also referred to as "high global warming potential gases" (high-GWP gases). California's annual statewide GHG emission inventory has historically been the primary tool for tracking GHG emissions trends.

The 2014 GHG Emission Inventory includes improved methodology updates. For example, to align the GHG inventory with the IPCC guidelines and share consistent methods with other subnational jurisdictions, ARB is now separating biogenic CO_2 from transportation fuels from the total emissions and tracking those emissions separately as informational items (beginning with 2014 reporting). Figure I-1 provides the GHG inventory trend using this new method. Additional information on the methodology for the GHG inventory can also be found here: www.arb.ca.gov/cc/inventory/data/data.htm

Figure I-1. California GHG Inventory Trend



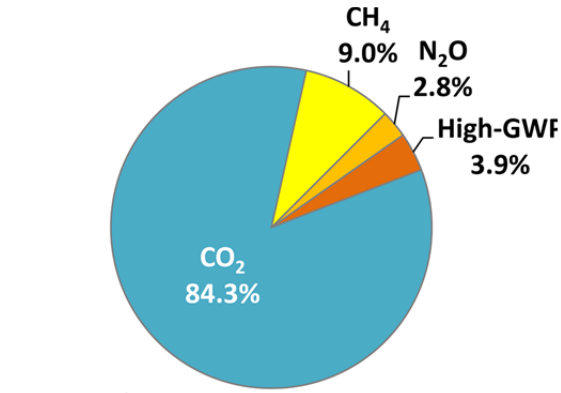
Carbon dioxide is the primary GHG emitted in California, accounting for 84 percent of total GHG emissions in 2014, as shown in Figure I-2 below. Figure I-3 illustrates that transportation is the single largest source of CO_2 in California, which is primarily comprised of on-road travel. Electricity production, industrial and residential sources also make important contributions to CO_2 emissions. Methane is the second most important GHG in California, accounting for nine percent of 2014 GHG emissions in CO_2 equivalent units. Agriculture accounts for the majority of methane emissions, primarily from livestock enteric fermentation and manure management. Industrial sources and landfills are also important sources of methane. Other sources contribute only a small fraction to methane emissions, and include residential, transportation, electricity generation, and commercial sources. Agriculture accounts for the majority of N_2O emissions, primarily from fertilizer and manure added to soil. Commercial and residential use of nitrogen fertilizer on turf and transportation are also important sources of N_2O. Industrial sources of N_2O include solid waste and wastewater treatment, manufacturing, refining and other sources.

High-GWP gases are fluorinated gases (F-gases) with GWPs hundreds to thousands of times greater than carbon dioxide, and are used across many different economic sectors, including energy, industry, commercial, residential, and transportation.

High-GWP gases include: sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and nitrogen trifluoride (NF_3). SF_6, PFCs, and NF_3 are long-lived F-gases whose emissions are being reduced by ARB regulations covering the semiconductor industry, electrical transmission, magnesium casting, and miscellaneous SF_6 uses. HFCs are short-lived climate pollutant synthetic gases used in refrigeration, air conditioning, insulating foams, solvents, aerosol products, and fire protection. HFCs comprise approximately 97 percent of the high-GWP gas emissions, and four percent of all GHG emissions from all sources, but are the fastest growing GHG emissions source globally as HFCs continue to replace ozone-depleting substances.

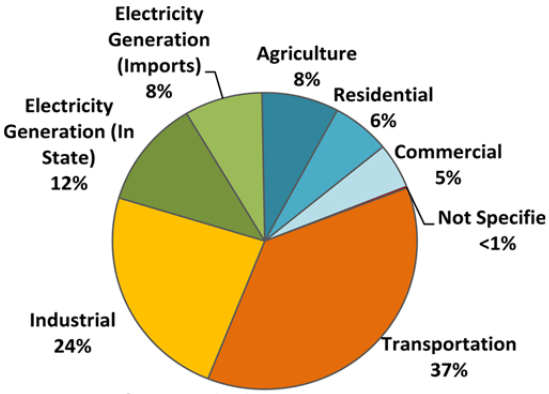
Figures I-2 and I-3 show State GHG emission contributions by pollutant and sector based on the 2014 GHG Inventory.

Figure I-2. Emissions by GHG



2014 Total CA Emissions: 441.5 MMTCO2e

Figure I-3. Emissions by Sector



2014 Total CA Emissions: 441.5 MMTCO2e

Another important climate-forcing pollutant not listed among the Kyoto Protocol gases is black carbon, which is also a short-lived climate pollutant. ARB has developed a statewide emission inventory for black carbon in support of the Draft Short-Lived Climate Pollutant Reduction Strategy, which is reported in two categories – non-forestry (anthropogenic) sources and forestry sources. The State's major anthropogenic sources of black carbon include off-road transportation, on-road transportation, residential wood burning, fuel combustion, and industrial processes (Figure I-4). The forestry category includes non-agricultural prescribed burning and wildfire emissions. For forest-related sources, wildfires account for the majority of black carbon emissions during a typical year. Because the extent and severity of wildfire varies from year to year, the State's black carbon inventory uses a 10-year average of fine particulate matter (PM2.5) emissions from wildfire to represent average conditions and avoid large variations (Table I-1). More information on ARB's black carbon inventory can be found at: www.arb.ca.gov/cc/inventory/slcp/slcp.htm

Figure I-4. California 2013 Anthropogenic Black Carbon Emission Sources*

*Using 100-year GWP

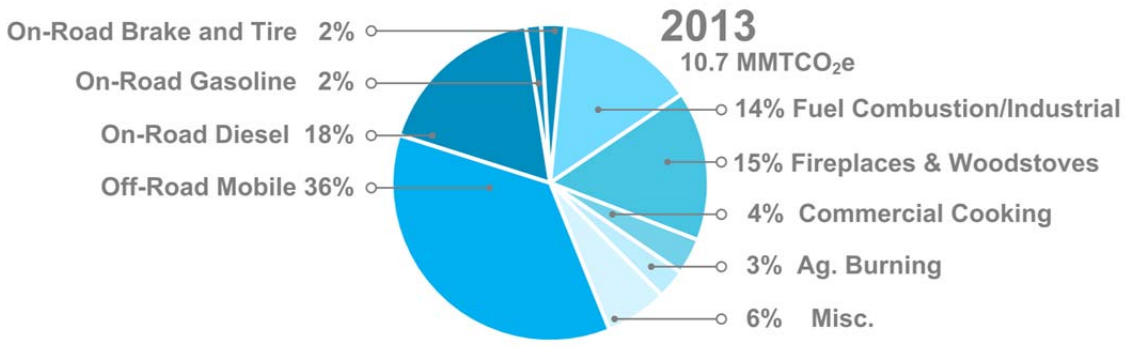


Table I-1. Ten Year Average California Forestry Black Carbon Emissions

Source	$MMTCO_2e$ (20-yr)	$MMTCO_2e$ (100-yr)
Prescribed Burning	3.6	1.0
Wildfire	86.7	24.4

The exchange of carbon dioxide between the atmosphere and California's natural and working lands sector is not currently quantified and is excluded from the inventory. A natural and working lands carbon inventory is essential for monitoring land-based activities that may increase or decrease carbon sequestration over time. ARB staff is working to develop a comprehensive inventory of GHG fluxes from all of California's natural and working lands using IPCC design principles. To that end, ARB anticipates releasing an ARB Natural and Working Lands (NWL) Inventory with the Spring Proposed 2030 Target Scoping Plan. This inventory will provide an estimate of GHG emissions reduction and changes in carbon stock from the agriculture and natural and working lands sectors. The ARB NWL Inventory will include an inventory of carbon stocks, stock-change (and by extension GHG flux associated with stock-change) with some attribution by disturbance process for the analysis period 2001-2010. Disturbance processes would include activities such as conversion from one land category to a different category, fire, and harvest. The ARB NWL Inventory will cover varieties of forests and woodlands, grasslands, and wetlands (biomass-stock-change only). The ARB NWL Inventory will include default carbon densities for croplands and urban/developed lands to facilitate stock-change estimation for natural lands that convert to cropland, natural lands that convert to developed lands, and for croplands that convert to developed lands. ARB is proposing to release the ARB NWL Inventory for public review in Spring 2017, with public outreach coordinated to support the 2030 Target Scoping Plan timelines. Recognizing the need to better include NWL fluxes and opportunities in modeling exercises that inform the scenario alternatives for this sector

included in this plan, ARB anticipates the need for adjusting the alternatives based on inventory findings and other modeling activities underway for the NWL sector.

2. Setting the 2030 Statewide Target

The 2030 target set by SB 32 of 40 percent reduction from 1990 levels by 2030 reflects the same science that informs the agreement reached in Paris by the 2015 Conference of Parties to the United Nations Framework Convention on Climate Change, aimed at keeping the global temperature increase below 2°C. The California 2030 statewide target represents the most ambitious GHG reduction goal for North America. The emissions reductions directed by SB 32 bring the annual 2030 statewide target emissions level for California down to 260 $MMTCO_2e$.

3. Greenhouse Gas Emissions Tracking

California maintains a GHG inventory that is consistent with IPCC practices to allow for comparison of the statewide GHG emissions with those at the national level and with other international GHG inventories. Statewide GHG emissions are calculated using many data sources. The primary data source is from reports submitted to ARB through the Regulation for the Mandatory Reporting of GHG Emissions (MRR). MRR requires facilities and entities with more than 10,000 metric tons CO_2e of combustion and process emissions, all facilities belonging to certain industries, and all electric power entities to submit an annual GHG emissions data report directly to ARB. Reports from facilities and entities that emit more than 25,000 metric tons of CO_2e are verified by an ARB-accredited third-party verification body. More information on MRR emissions reports can be found at: www.arb.ca.gov/cc/reporting/ghg-rep/reported-data/ghg-reports.htm

ARB also relies on data from other California State and federal agencies to develop an economy-wide GHG inventory for the State of California. All data sources used to develop the GHG Inventory are listed in the GHG Emission Inventory supporting documentation at: www.arb.ca.gov/cc/inventory/data/data.htm

Concurrently, other State agencies, non-profit organizations, and research institutions are developing and testing methodologies and models to quantify GHG fluxes from California's natural and working lands. ARB's ongoing work on this inventory will serve as one source of data to gauge the scope of GHG reduction potential from California's natural and working lands and monitor progress over time. ARB will evaluate other data sources and methodologies for use in validating or supporting the ARB inventory or project-scale tracking. As discussed in Chapter lll, interagency work is underway to integrate and account for the land use and management impacts of development, transportation, housing and energy policies into this plan.

GHG mitigation action may cross geographic borders as part of international and sub-national collaboration, or as a natural result of implementation of regional policies. It is important to be able to track and attribute GHG reductions toward action and ensure

any reductions claimed are real, without any double counting. The State has begun exploring how to build an accounting framework that utilizes additional program data to better reflect broader benefits of our policies. The ability for subnational regions to account for shared results of collaborative efforts, such a linked cap-and-trade program, is important to support continued collaborative action at this level. Further, California believes data transparency is critical to demonstrate real progress towards reducing GHGs in any context and fully understanding the impact of GHG mitigation policies.

Appendix F (to be released in early 2017) will provide more technical detail on how a potential GHG accounting framework to better reflect the benefits of collaboration and State policies could be structured while relying on the ARB GHG Inventory and program data. This appendix will also provide examples of data transparency that would support confidence in any claims of GHG emission reductions while avoiding double counting so that any claims for emissions reductions are real and not claimed by multiple parties.

D. California's Approach to Addressing Climate Change

1. Integrated Systems

To establish a comprehensive approach to achieve the State's climate goals, this 2030 Target Scoping Plan incorporates multiple ongoing State efforts. For example, as we address future mobility, we must show how existing efforts underway – such as the California Sustainable Freight Action Plan, Mobile Source Strategy, California Transportation Plan 2040, urban planning, and goals for enhancement of the natural environment – can complement each other while providing air quality and climate benefits. Each of these efforts is important in its own right, but looked at together they provide insights into the trade-offs of policies across all sectors and tell a larger story about how the State will move towards a sustainable and resilient future. The 2030 Target Scoping Plan identifies policy choices that can minimize costs and optimize "win–win" solutions, while also recognizing that it is often difficult to accomplish all of the State's goals at the same time.

2. Promoting Resilient Economic Growth

The existing policies, strategies, plans, and regulations that we already have in place are helping many California businesses to better compete in a global economy, and have created new investments, businesses, and jobs to support a clean energy economy. We have learned that California's portfolio-based climate strategy can achieve great success when accompanied by consistent and rigorous GHG monitoring and reporting, a robust public process, and an effective enforcement program for the few that choose not to play by the rules. Our experience has also shown us that California's economy and infrastructure can be strengthened while also achieving other important environmental benefits such as reductions in criteria pollutants and toxic air contaminants, especially in California's most vulnerable communities.

The benefits to be achieved consistent with the 2030 Target Scoping Plan are part of California's comprehensive strategy to achieve lasting emissions reductions throughout the economy. California's strategic vision for achieving at least a 40 percent reduction in GHG emissions by 2030 is based on the principle that economic prosperity and environmental sustainability can be achieved together. Undertaking the actions that are presented in plan presents opportunities for the future, but progress towards our goals is already evident today. For example, in 2015, California added more than 20,000 new jobs in the solar sector. This was more than half of the positions in this industry across the nation. Employment in the clean economy grew by 20 percent between 2002 and 2012, which included the period of economic recession around 2008.[23] A clean economy can be a resilient economy.

Achieving our global goals requires a structural shift in the global economy, which is already underway. Successfully driving this transition will require cleaner and more efficient technologies, new policies and incentives that better recognize and reward innovation, and prioritize low carbon investments. It also requires new policies and incentives at multiple jurisdictional levels to ensure that this transition advances land use and natural resource management objectives for both GHG mitigation and climate adaptation. Synergistic linkages between technological advances and resource stewardship must be intentional to be successful and result in sustainable development. These efforts are already underway, as highlighted through the development and implementation of Sustainable Communities Strategies (SCSs) pursuant to Senate Bill (SB) 375, which link transportation, housing, and climate policy, and are designed to reduce per capita GHG emissions while providing benefits ranging from improved air quality and expanded transportation options to revitalization of city centers and investment in disadvantaged communities. SB 375 is just one of many ways to address housing and transportation needs and provide climate benefits. The 2030 Target Scoping Plan identifies new ways to promote the technologies and infrastructure required to meet our collective climate goals, while also presenting the vision for California's continuing efforts to foster a sustainable, clean energy economy.

3. Protecting, Enhancing, Innovating, and Increasing Sequestration in the Natural Environment and Working Lands

California's natural and working lands make the State a global leader in agriculture, a U.S. leader in forest products, and a global biodiversity hotspot. These lands support clean air, wildlife and pollinator habitat, and rural economies, and are critical components of California's water infrastructure. And keeping these lands and waters intact and at high levels of ecological function, including resilient carbon sequestration, is necessary for the well-being and security of Californians in 2030, 2050, and beyond. Forests, rangelands, farms, wetlands, riparian areas, deserts, coastal areas, and the ocean store substantial carbon in biomass and soils.

Natural and working lands must also be central to the State's climate change strategy. Storing carbon in trees, other vegetation, soils, and aquatic sediment is the most

[23] clean-economy.org/wp-content/uploads/2015/01/Clean-Energy-Climate-Change-Analyses_January2015.pdf

effective way to remove carbon dioxide from the atmosphere. This 2030 Target Scoping Plan includes policies and programs that prioritize protection and enhancement of California's landscapes, including urban landscapes, and identifies management actions that can be taken to increase the sequestration potential of those resources. We cannot ignore the relationships between sectors or the adverse impacts that climate change is having on the environment itself. We must consider important trade-offs in developing the State's climate strategy by understanding the near and long-term impacts of various policy scenarios and actions on our State and local communities. This 2030 Target Scoping Plan builds off of ongoing efforts to identify targets for natural and working lands, such as through the Forest Carbon Draft Plan,[24] and identifies policies that set us on the path towards achieving the carbon sequestration potential of the sector.

4. Improving Public Health

The State has always been ambitious in addressing public health issues. California has been protecting and improving air quality for more than 50 years. The State's regulations have been a model for other states, the federal government, and other countries. The State's drive to improve air quality will continue and remain a priority as we address climate change. Several of the strategies included in this plan are primarily developed to help the State achieve ambient air quality standards for air pollutants with direct health impacts, while also delivering GHG reductions.

Climate change itself is already impacting the health of our communities, which are exacerbating the existing health inequities. Those facing the greatest health burdens include low-income individuals and households, the very young and the very old, communities of color, and those who have been marginalized or discriminated against based on gender or race/ethnicity.[25] Economic factors, such as income, poverty, and wealth, are collectively one of the largest determinants of health. Addressing climate change presents a significant opportunity to improve public health for all of California's residents and work toward making our State the healthiest in the nation.

To successfully address public health inequities, the State must continue to address the environmental concerns in disadvantaged communities. At the same time, in order to achieve the 2030 target and the longer-term 2050 target, the State must move forward with sustainable development. The United Nations defines sustainable development as "development that meets the needs of the present without compromising the ability of the future generations to meet their own needs."[26] By identifying and addressing the disproportionate impacts felt today and planning, designing, and implementing actions for a sustainable future, we can be part of the solution to make public health inequities an issue of the past.

[24] Forest Climate Action Team website: www.fire.ca.gov/fcat/
[25] California Department of Public Health (CDPH). 2015. The Portrait of Promise: The California Statewide Draft Plan to Promote Health and Mental Health Equity. A Report to the Legislature and the People of California by the Office of Health Equity. Sacramento, CA: California Department of Public Health, Office of Health Equity.
[26] www.un.org/en/ga/president/65/issues/sustdev.shtml

Per AB 197, Chapter V identifies potential key statewide climate mitigation measures and their potential co-benefits, such as reductions in criteria pollutants and toxic air contaminants.

5. Environmental Justice

Fair and equitable climate action requires addressing the inequities that create and intensify community vulnerabilities. The capacity for resilience in the face of climate change is significantly driven by living conditions and the forces that shape them, such as access to services such as health care, healthy foods and water, and safe spaces for physical activity; income; education; housing; transportation; environmental quality; and good health status. Thus, strategies such as alleviating poverty, increasing access to economic opportunities, improving living conditions, and reducing health and social inequities will result in more climate-resilient communities. Promoting a low-carbon California economy will reduce GHG emissions and create a healthier environment for all of California's residents, especially those living in the State's most disadvantaged communities.

It is important to note that both the impacts of climate change and the health inequities we see in our communities share similar root causes: the inequitable distribution of social, political and economic power. These power imbalances result in systems (i.e., economic, transportation, land use zoning, etc.) and conditions that drive both health inequities and GHG emissions. As a result, we see communities with inequitable living conditions, such as low-income communities of color living in more polluted areas, facing climate change impacts that compound and exacerbate existing sensitivities and vulnerabilities. Fair and healthy climate action requires addressing the inequities that create and intensify community vulnerabilities.

It is critical that environmental justice communities share in the benefits of the cleaner economy that California is building. This includes environmental and economic benefits. Low-income customers that are enrolled in the California Alternate Rates for Energy (CARE) Program or the Family Electric Rate Assistance (FERA) Program are also eligible to receive a rebate under the California Climate Credit, or a credit on residential and small business energy bills resulting from the sale of allowances received by investor-owned utilities as part of the Cap-and-Trade Program. SB 1018 (Committee on Budget and Fiscal Review, Chapter 39, Statutes of 2012) and other implementing legislation requires that Cap-and-Trade auction monies deposited into the GGRF be used to further the purposes of AB 32, while also fostering job creation by promoting in-State GHG emissions reduction projects carried out by California workers and businesses.

Further, SB 535 (De Leon, Chapter 830, Statutes of 2012) and AB 1550 (Gomez, Chapter 369, Statutes of 2016) direct State and local agencies to make significant investments from monies deposited into the GGRF that improve California's most vulnerable communities. Specifically, these laws require that at least 35 percent of GGRF monies benefit disadvantaged communities and low-income communities and

households. Based on agency data reported as of December 2015, we are on track to meet these goals; 39 percent ($356 million) of the $912 million are funding projects located within disadvantaged communities.

Environmental Justice Advisory Committee

AB 32 calls for ARB to convene an Environmental Justice Advisory Committee (EJAC or Committee), to advise the Board in developing the Scoping Plan, and any other pertinent matter in implementing AB 32. It requires that the Committee be comprised of representatives from communities in the State with the most significant exposure to air pollution, including, but not limited to, communities with minority populations or low-income populations, or both. ARB engaged thirteen environmental justice and disadvantaged community representatives for the 2030 Target Scoping Plan, which kicked off the deliberation process with its first EJAC meeting in December 2015. As with the Initial Scoping Plan and First Update, this Discussion Draft development process to date includes extensive consultation with the EJAC. The consultation for this Discussion Draft also included extensive consultation and engagement directly with disadvantaged communities through 11 community meetings held throughout the State (see below); additional community meetings are being planned through Spring 2017.

Environmental Justice Advisory Committee

Martha Dina Argüello	Physicians for Social Responsibility	Los Angeles
Colin Bailey	The Environmental Justice Coalition for Water	Sacramento
Gisele Fong	End Oil	Los Angeles
Tom Frantz	Association of Irritated Residents	Central Valley
Katie Valenzuela Garcia	Oak Park Neighborhood Association	Sacramento
Sekita Grant	The Greenlining Institute	Statewide
Kevin Hamilton	Central California Asthma Collaborative	Central Valley
Rey León	Valley LEAP	Central Valley
Luis Olmedo	Comité Civico Del Valley	Imperial Valley
Kemba Shakur	Urban Releaf	Bay Area
Mari Rose Taruc	Asian Pacific Environmental Network	Bay Area
Eleanor Torres	The Incredible Edible Community Garden	Inland Empire
Monica Wilson	Global Alliance for Incinerator Alternatives	Bay Area

Public Committee Meetings

The Committee has met ten times across California since December 2015 to discuss this 2030 Target Scoping Plan and develop draft initial recommendations.

Statewide Community Engagement Meetings

Starting in July 2016, EJAC hosted with ARB support, a robust community engagement process, conducting 11 community meetings throughout the State and collecting over 700 individual comments. The community meetings were well received and attended by several hundred residents and local community representatives.

Environmental Justice Advisory Committee Community Meetings	
July 11, 2016	San Bernardino
July 14, 2016	San Diego
July 19, 2016	Oakland
July 25, 2016	Wilmington
July 26, 2016	South Los Angeles
July 28, 2016	Modesto
July 28, 2016	Bakersfield
July 28, 2016	Fresno
July 29, 2016	Sacramento
October 22, 2016	Brawley
November 4, 2016	Orleans

To enhance the community engagement, ARB staff coordinated with staff from local government agencies and sister agencies. At the community meetings, staff from State and local agencies participated in extensive, topic-specific "world café" discussions with local residents at these meetings. The extensive collaboration between the EJAC, State and local agencies provided local residents the opportunity to meet with local advocates and local and State government officials to share concerns and provide input on ways California can meet its 2030 target while addressing a number of related issues and concerns.

Draft Initial Recommendations

The EJAC's Initial Recommendations for the 2030 Target Scoping Plan were informed by comments received at community meetings listed above and Committee member expertise. Initial Recommendations were provided for the sector focus areas, overarching environmental justice policy, and California Climate Investments. The Committee also sorted their recommendations into five themes: partnership with environmental justice communities, equity, economic opportunity, coordination, and long-term vision. Finally, the EJAC provided direction that their Initial Recommendations are intended "to be read and implemented holistically and not independently of each other."

The EJAC's Overarching Recommendations for Partnership with Environmental Justice Communities, Equity, Coordination, Economic Opportunity, and Long-Term Vision include the following recommendations:

- Encouraging long-term community engagement and neighborhood-level solutions to promote the implementation of the State's climate plans, using strategies identified by the Committee.
- Considering equity when examining issues in any sector and have ARB conduct an equity analysis on the 2030 Target Scoping Plan and each sector, with guidance from the Committee.
- Developing contingency plans for mitigation and adjustment if emissions increases occur as programs are implemented.
- Coordination of strategies between State, federal, and local agencies for strong, enforceable, evidence-based policies to prevent and address sprawl with equity at the center.
- Maximizing the accessibility of jobs, incentives, and economic benefits for Californians and the development of a just transition for workers and communities in and around polluting industries.
- Ensuring that AB 32 economic reviewers come from various areas around the State to represent insights on economic challenges and opportunities from those regions.
- Not limiting the 2030 Target Scoping Plan to examining interventions and impacts until 2030, or even 2050. Planning and analyses on a longer-term scale to prevent short-sighted mistakes and reach the long-term vision, as actions today and for the next 30 years will have impacts for seven generations.
- The 2030 Target Scoping Plan must prioritize whenever possible, the innovation of new technologies or strategies to reach even deeper emissions cuts.
- And, convening the Committee beyond the Scoping Plan development process.

The EJAC's Initial Recommendations, in their entirety, are included in Appendix D and available here: www.arb.ca.gov/cc/ejac/ejac_recommendations082616revised.pdf. The EJAC will continue to hold regular public meetings to discuss the 2030 Target Scoping Plan and formalize their recommendations to inform the Spring Proposed 2030 Target Scoping Plan. More information about the EJAC and recommendations on the previous Scoping Plans and current 2030 Target Scoping Plan is located here: www.arb.ca.gov/ejac.

In 2017, ARB will identify the locations in the report where individual EJAC recommendations are incorporated or if the recommendation is beyond the scope of the 2030 Target Scoping Plan. In cases where a recommendation was not incorporated, either wholly or in part, an explanation will be provided.

6. Relying on Sound Science and Research

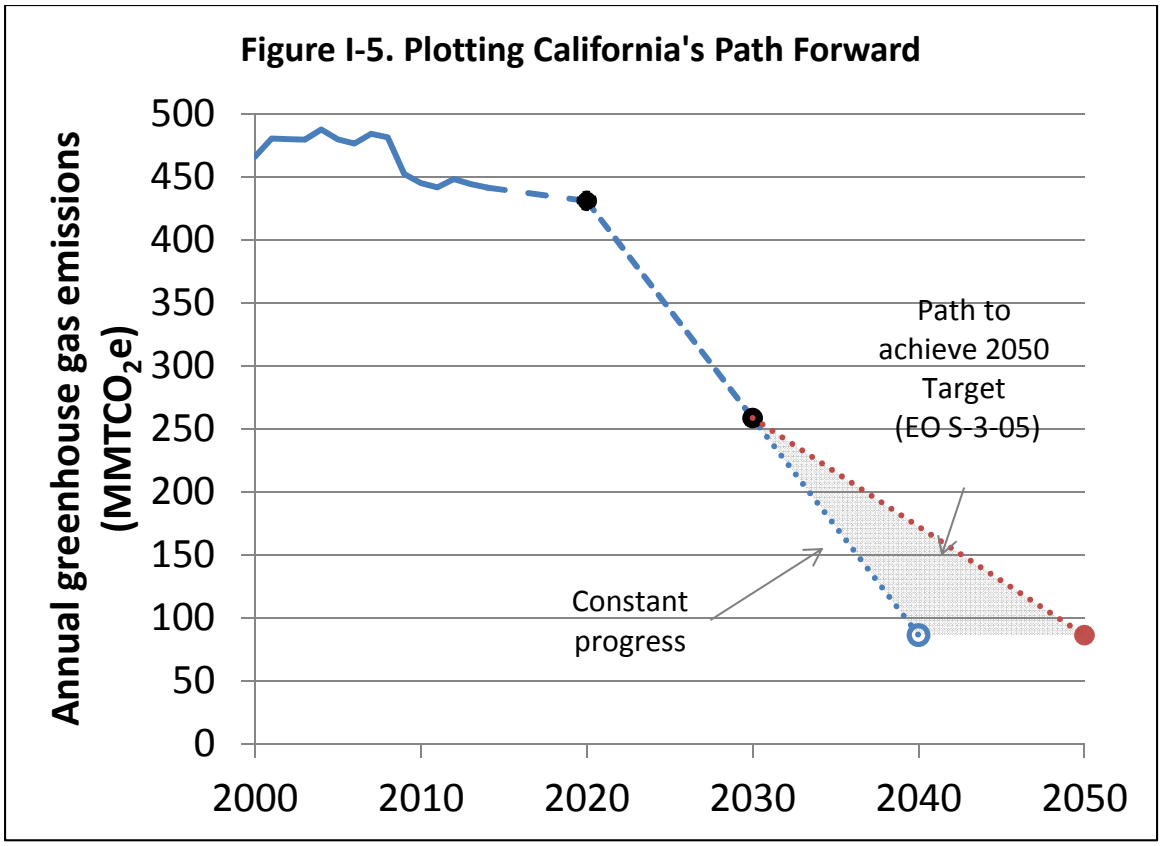
Sound science underpins, updates and strengthens climate policy. The scientific record overwhelmingly and undeniably demonstrates that climate change is occurring. It also connects human-related activities to the atmospheric burden of CO_2 with expansion at

an unprecedented rate. In developing this plan, time matters. The policies that are included must rapidly lead to real results to avoid the most catastrophic impacts of climate change. This Discussion Draft identifies policies based on solid science and identifies additional research needs, while also recognizing the need for flexibility in the face of a changing climate. Ongoing research to better understand systems where our knowledge is weaker will allow for additional opportunities to set targets and identify actionable policies.

7. Setting the Path to 2050

While the 2030 Target Scoping Plan charts the path to achieving the 2030 GHG emissions reduction target, we need momentum to propel us to the 2050 statewide GHG target (80 percent below 1990 levels). In developing the 2030 Target Scoping Plan, we are considering what policies are needed for the mid-term and long-term, knowing that some policies for the long-term must begin implementation now. For example, Zero Net Carbon Buildings is an important strategy to achieve the 2050 target, but requires work to begin now in reviewing and evaluating research in this area, a planning horizon for targets, and identification of implementation mechanisms. At the same time, we need to consider policies for 2030 that do not simply dead end in 2030, but rather can continue to help support the State's long-term climate objectives. As with all investments, whether financial or personal, the approach we take must balance risk, reward, longevity, and timing. For example, do we promote renewable gas in the transportation or electricity sectors, or is this resource best utilized for displacement of fossil natural gas in the residential and industrial sectors? For the forest sector, are we comfortable with policies that may result in some near-term carbon loss, but ultimately support more resilient and healthier forests in the longer timeframe? And, are we willing to pursue policies that we know are needed for the 2050 target, but may not significantly reduce GHG emissions in the near-term?

Figure l-5 provides an illustration of the potential GHG reductions that are possible by making consistent progress between 2020 and the 2050 versus an approach that begins with the 2030 target and then makes progress towards the 2050 level included in Executive Order S-3-05. Depending on the success of our achieving the 2030 target, taking a consistent approach may be possible and would help achieve the 2050 target earlier and potentially prevent global warming of 1.5^{o} C. The path to achieving the 2050 target should leave open the possibility for both tracks.



8. Intergovernmental Collaboration

Federal, state, and local action can be complementary. We have already seen federal action through the Clean Air Act, regulations for GHG emissions from passenger cars and trucks, development of the Clean Power Plan to limit GHGs from power plants, and the advancement of methane rules for oil and gas production. There are also times when California, working with other climate leaders, acts to advance more aggressive federal action and protect the ability of states to move forward to address climate change. Both collaboration and advocacy will mark the road ahead.

Regional and local governments and agencies are leaders in addressing climate change and are uniquely positioned to reduce emissions from certain sources, especially by reducing the demand for electricity, transportation fuels, and natural gas. Many local governments have already initiated efforts to reduce GHG emissions beyond those required by the State. For example, many cities and counties are improving their municipal operations by upgrading their vehicle fleets, retrofitting government buildings and streetlights, purchasing greener products, and implementing waste-reduction policies. In addition, they are adopting more sustainable codes, standards, and general plan improvements to reduce their community's footprints and emissions. The State is striving to provide a supportive framework to advance these and other local efforts, while also recognizing the need to build on, and export, this success to other regional and local governments through California and beyond.

Local actions are critical for implementation of California's ambitious climate agenda. Importantly, at the same time, State policies, programs, and actions – such as many of those identified throughout this Discussion Draft – can help to support, incentivize, and accelerate local actions to achieve mutual goals, and are indeed critical to achieving both State and local goals and priorities for more sustainable and resilient communities. Local municipal code changes, zoning changes, or policy directions that apply broadly to the community within the general plan or climate action plan area can help promote the deployment of renewable, zero emission, and low-carbon technologies such as zero net energy buildings, renewable fuel production facilities, and zero emission charging stations. Local decision-making has an especially important role in achieving reductions of GHG emissions generated from transportation. Over the last 60 years, development patterns have led to sprawling suburban neighborhoods, a vast highway system, growth in automobile ownership, and under-prioritization of infrastructure for public transit and active transportation. Local decisions about these policies today can establish a more sustainable built environment for the future. Local governments can incentivize locally generated renewable energy and infrastructure for alternative fuels and electric vehicles, implement water efficiency measures, develop waste-to-energy and waste-to-fuel projects, and enhance and preserve urban forests and other greenspace. Indeed, many local agencies are already implementing ambitious climate strategies. These types of local actions complement statewide measures and may be more cost effective and provide more co-benefits than relying exclusively on top-down statewide regulations to achieve the State's climate stabilization goals. This Discussion Draft explores the potential benefit of any regional or local targets to assist local agencies in their efforts to address climate change.

9. International Efforts

California is not alone in its efforts to address climate change. The agreement reached in Paris by the 2015 Conference of Parties to the United Nations Framework Convention on Climate Change (UNFCCC), aimed at keeping the global temperature rise below 2°C, is spurring action across the world. The results of this agreement will translate into worldwide action to reduce GHGs and support decarbonization across the global economy. And, it is not just action and coordination at the international and national levels that is important. Subnational governments are front and center on this issue. With the establishment of the Under 2 Memorandum of Understanding,[27] the Governors' Climate and Forests Task Force,[28] and the Western Climate Initiative,[29] among other partnership initiatives, subnational jurisdictions from the around the world are collaborating on how best to address climate change and are leading the way.

From its inception, AB 32 recognized the importance of California's climate leadership and engagement with other jurisdictions, and directed ARB to consult with the federal government and other nations to identify the most effective strategies and methods to reduce GHGs, manage GHG control programs, and to facilitate the development of

[27] Under 2 MOU website: under2mou.org/
[28] Governors' Climate and Forests Task Force website: www.gcftaskforce.org/
[29] Western Climate Initiative website: www.wci-inc.org/

integrated and cost-effective regional, national, and international GHG reduction programs. California undertook a two-pronged approach: first, we assessed our State-specific circumstances to develop measures that would apply specifically in California; and second, we simultaneously assessed which measures might lend themselves, through careful design and collaboration with other interested jurisdictions, toward linked GHG reduction programs. Under the Clean Air Act, California has a special role as an innovator and leader in the area of motor vehicle emission regulations, which allows our State to adopt motor vehicle emission standards that are stricter than federal requirements. These motor vehicle standards have been emulated around the country and the world, leading to widespread health benefits. Similarly, by enacting a comprehensive strategy that can be exported nationally and internationally, California can lead the world in tackling climate change.

Today, the State's Cap-and-Trade Program is linked with Québec's program; ongoing discussions to link with Ontario's emerging emissions trading system are underway. Low-carbon fuel mandates similar to California's LCFS have been adopted by the United States Environmental Protection Agency (U.S. EPA), and by other jurisdictions including Oregon, British Columbia, the European Union, and the United Kingdom. Over two dozen states have a renewables portfolio standard. California is a member of the Pacific Coast Collaborative.[30] California continues to discuss carbon pricing through a cap-and-trade program with international delegations. We have seen design features of our program incorporated into other emerging and existing programs, such as the European Union Emissions Trading System and China's emerging national trading program.

[30] pacificcoastcollaborative.org/

II. Key Sectors

It is important to understand the sources of emissions when considering opportunities for policies and programs to reduce greenhouse gases (GHGs). Climate change mitigation policies must be considered in the context of the sector's contribution to the State's total GHGs, while also considering any co-benefits for criteria pollutant and toxic air contaminant reductions. The transportation, electricity (in-State and imported), and industrial sectors are the largest contributors to the GHG inventory and present the largest opportunities for GHG reductions. However, to ensure decarbonization across the entire economy and to meet our 2030 GHG target, policies must be considered for other sectors. Policies that support energy efficiency, alternative fuels, and renewable power can also provide co-benefits for both criteria and toxic air pollutants.

Any specific policies identified within the Final 2030 Target Scoping Plan that will ultimately be considered by the Air Resources Board (ARB or Board) or other State agency for adoption will be subject to a subsequent analytical and public process to develop and identify the full requirements and process for implementation. For example, a change in the Low Carbon Fuel Standard (LCFS) Carbon Intensity (CI) target would only take effect after a subsequent rulemaking for that regulation that would include its own public process, and California Environmental Quality Act (CEQA), economic, and public health analyses. Many policies for reducing emissions towards the 2030 target are already known. For example, the increased Renewables Portfolio Standard (RPS), energy efficiency requirements, and various transportation plans will go far in reducing GHGs towards achieving the 2030 target, while delivering reductions in criteria and toxic air pollutants. This Discussion Draft identifies additional policies or program enhancements we will need to achieve remaining GHG reductions in a complementary, flexible, and cost-effective manner to meet the 2030 target. These policies should continue to encourage reductions beyond 2030 to keep us on track to stabilize the climate. Policies that ensure economy-wide investment decisions that incorporate consideration of GHG emissions are particularly important.

As we pursue GHG reduction targets, we must acknowledge the integrated nature of our built and natural environments, and cross-sector impacts of policy choices. Each of the policies directed at the built environment must be considered in the broader context of the high level goals for other sectors, including the natural working lands sector. For example, policies that support natural and working lands can reduce emissions and sequester carbon, while also providing ecosystem benefits such as better water quality, increased water yield, soil health, reduced erosion and habitat connectivity. These policies and co-benefits will be considered as part of the integrated strategy outlined above. Table ll-1 provides examples of the cross-sector interactions between the main sectors analyzed for the Discussion Draft (energy; transportation; industry; water; waste management; and natural and working lands), and which are discussed in this chapter.

Table II-1. Cross-Sector Relationships

Sector	Example Interactions with Other Sectors
Energy	Hydroelectric power, cooling, cleaning, WWTP bioenergy Vehicle-to-grid power; electricity supply to vehicle charging infrastructure Biomass feedstock for bioenergy, land for utility-scale renewable energy (solar, wind) Agricultural waste and manure feedstocks for bioenergy Organic waste for bioenergy
Transportation	Electric vehicles, natural gas vehicles; more compact development patterns that reduce Vehicle Miles Travelled (VMT) also demand less energy per capita More compact development patterns that reduce VMT also demand less water per capita Reducing VMT also reduces energy demands necessary for producing and distributing fuels and vehicles and construction and maintenance of roads Biomass feedstock for biofuels Agricultural waste and manure feedstocks for biofuels Organic waste for biofuels Greenfield suburban development on natural and working lands leads to increased VMT
Industry	Potential to electrify fossil natural gas equipment, substitution of fossil-based energy with renewable energy Greenfield urban development impacts

Sector	Example Interactions with Other Sectors
Water	Energy consumption for water pumping, treatment, heating; resource for cooling, cleaning; WWTP bioenergy Use of compost to help with water retention/ conservation/ drought mitigation Land conservation results in healthier watersheds by reducing polluted runoff and maintaining properly functioning ecosystems
Waste Management	Composting, anaerobic digestion, and wastewater treatment plant capacity to help process organic waste diverted from landfills Compost for carbon sequestration, erosion control in fire-ravaged lands, water conservation, and healthy soils Replacing virgin materials with recycled materials associated with goods production; enhanced producer responsibility reduces energy impacts of consumption Efficient packaging materials reduces energy consumption and transportation fuel use
Agriculture	Crop production, manure management; WWTP biosolids for soil amendments Agricultural waste and manure feedstocks for bioenergy Compost production in support of Healthy Soils Initiative
Natural & Working Lands	Biomass for electricity Biomass for biofuels Provides habitat for species and functions to store water, recharge groundwater, naturally purify water, and moderate flooding

A. Low Carbon Energy

The energy sector in California is composed of electricity and natural gas infrastructure, which brings electricity and natural gas to homes, businesses, and industry. This vast system is critical to the California economy and to public well-being, and pivotal to reducing GHG emissions in California.

Historically, power plants largely generated electricity by combusting fossil fuels. In the 1970's and early 1980's, a significant portion of California's power supply came from coal and petroleum resources. To reduce air pollution and promote fuel diversity, the State has shifted away from these resources to natural gas, renewable energy, and energy efficiency programs, resulting in GHG emissions reductions. Emissions from the electricity sector are currently approximately 20 percent below 1990 levels and are well on their way to achieving deeper emissions cuts by 2030. Since 2008, renewable generation almost doubled, coal generation reduced by more than half, and greenhouse gas emissions reduced by a quarter.

Renewable energy and energy efficiency measures can result in significant public health and climate benefits by displacing air pollution and GHG emissions from fossil-fuel based energy sources (Buonocore, et al., 2015), as well as by reducing the health and environmental risks associated with the drilling, extraction, transportation, and storage of fossil-fuels, especially for communities living in close proximity to fossil-fuel based energy operations.[31]

Carbon dioxide is the primary GHG associated with the electricity system, while methane is the dominant GHG from the natural gas system. The electricity sector, which is comprised of in-State generation and imported power to serve California load, has made great strides to help California achieve its climate change objective. Renewable energy has shown tremendous growth, with capacity from large-scale solar, wind, geothermal, hydropower, and biomass power plants growing from 6,600 megawatts (MW) in 2010 to nearly 14,300 MW in 2015.[32,33]

Renewable energy adoption in California has been promoted through several funding mechanisms, such as the California Solar Initiative (CSI) programs, Self-Generation Incentive Program (SGIP), Net-Energy Metering (NEM), and federal tax credits. These mandates and incentives have spurred both utility-scale and small-scale customer-developed renewable energy projects.

Senate Bill 350 (Chap. 547, Stats. of 2015) requires large publicly-owned utilities and all load-serving entities under the jurisdiction of the California Public Utilities Commission (CPUC) to file integrated resource plans (IRPs) with the California Energy Commission (CEC) and CPUC respectively that demonstrate how they will meet the electricity sector's share of the State's 2030 GHG reduction target. ARB, CEC and the CPUC are

[31] For a detailed analysis of public health implications and impacts of climate mitigation measures, please see Appendix J: Public Health Analysis (to be released in early 2017).
[32] Large-scale means 20 MW or larger capacity.
[33] www.energy.ca.gov/renewables/trackingprogress/documents/renewable.pdf

currently developing the guidelines that publicly-owned utilities and load-serving entities will follow to prepare and submit IRPs. The 2030 Target Scoping Plan will provide the information to establish the range of reductions required for this sector and those will be translated into planning target ranges for the individual load-serving entities. The creation of this process by the Legislature incorporates GHG reductions into the long-term resource planning process and grants retail electricity sellers in California greater flexibility to determine the optimal way to reduce GHG emissions, beyond the contributions of the 50 percent RPS and energy efficiency goals included in SB 350, in order to achieve the electricity sector's share of the 2030 goal. The IRP process will reduce GHG emissions by driving the procurement of renewable energy and other preferred resources beyond the minimums required by law in a way that allows retail electricity sellers to tailor their portfolios to their particular needs.

Energy efficiency is another key component to reducing GHG emissions from the energy sector, and will be another key component of IRPs. CEC and CPUC have adopted a "loading order" specifying California's policy to invest first in cost-effective energy efficiency and demand response, and then renewables and clean distributed generation, before conventional generation. Utilities have been offering energy efficiency programs, such as incentives to California customers for decades, and CEC has continually updated building and appliance standards. In the context of IRPs, utility-ratepayer-funded energy efficiency programs will continue to be a key strategy for reducing GHG emissions in the electricity sector and must be addressed in load-serving entities' IRPs.

SB 350 requires CEC and CPUC to establish annual targets for statewide energy efficiency savings and demand reduction that will achieve a cumulative doubling of statewide energy efficiency savings in electricity and natural gas end uses by 2030. These targets can be achieved through appliance and building energy efficiency standards, utility incentive, rebate, and technical assistance programs, and other programs. Achieving greater efficiency savings in existing buildings, as directed by Governor Brown in his 2015 inaugural speech, will be essential in meeting the double energy efficiency savings goal. In September 2015, CEC adopted the Existing Buildings Energy Efficiency Action Draft Plan, which is designed to provide foundational support and strategies to enable scaling of energy efficiency in the built environment.

In addition, green building regulations and programs offer complementary opportunities to address the direct and indirect effects of buildings on the environment, beyond the appliance and energy efficiency standards promulgates by CEC, by incorporating additional strategies to minimize overall energy use, water use, waste generation, and transportation impacts. The Governor's Green Buildings Executive Order B-18-12 for State buildings and the California Green Building Standards (CALGreen) Code[34] are key State initiatives supporting emission reductions associated with buildings, and some local governments are taking action by adopting "beyond code" green building standards. Looking forward, there is a need to establish a path towards transitioning to

[34] The authority to update and implement the CALGreen Code is the responsibility of several State agencies identified in California Building Standards Law.

zero net carbon buildings, which will be the next generation of buildings that can contribute significantly to achieving long-term climate goals. Recent research activities have provided results to better quantify GHG emission reductions of green buildings and additional research activities need to continue to expand their focus to support technical feasibility evaluations and implementation. Green buildings are discussed in further detail in Appendix G (to be released in early 2017).

Fossil-fuel-based natural gas is a significant fuel source for both in-State electricity generation and electricity imported into California. It is also used in transportation applications and in residential, commercial, industrial, and agricultural sector end-uses. Greenhouse gas emissions from combustion of fossil natural gas decreased from 134.71 million metric tons of CO_2 equivalents ($MMTCO_2e$) in 2000 to 127.73 $MMTCO_2e$ in 2014, while natural gas pipeline fugitive emissions were estimated to be 4.0 $MMTCO_2e$ in 2014, and have been nearly unchanged since 2000.[35]

GHG-reducing alternatives to fossil natural gas include efficiency, fuel switching and renewable natural gas (RNG), or biomethane. California utilities already spend approximately $200 million per year to fund programs and technologies that reduce overall demand for natural gas. Programs to support solar and electric heating further reduce overall demand. RNG is a pipeline-quality gas that is fully interchangeable with fossil natural gas and hydrogen in small quantities. RNG volume has been increasing from approximately 1.5 million diesel gallon equivalent (dge) in 2011 to more than 68.5 million dge in 2015, and continued substitution of RNG for fossil natural gas would help California reduce our dependence on fossil fuels. In addition, RNG can be sourced by recovering methane from landfills, livestock operations, and wastewater treatment facilities through the use of existing technologies, thereby also reducing methane emissions. The State will need to consider how best to allocate the use of RNG, as it can displace fossil natural gas use in the electricity, transportation, industrial, and commercial and residential sectors, and will need time to overcome technology, cost, and market barriers to deliver enough quantities to meet any or all of these needs. It is important to note that legal, feasibility, cost, and regulatory barriers would need to be overcome to use Renewable Natural Gas as described above.

For a description of some of the major regulations and programs that are driving GHG reductions in the energy sector, see Appendix G (to be released in early 2017). Many of these existing strategies must be enhanced to help the State meet its climate goals.

1. Looking to the Future

This section outlines the high-level objectives and goals to reduce GHGs in this sector.

Electricity Goals

- Achieve sector-wide and load-serving entity specific GHG reduction planning targets set by the State through Integrated Resource Planning
- Reduce fossil fuel use

[35] www.arb.ca.gov/ei/ei.htm

- Reduce energy demand

Natural Gas Goals

- Ensure safety of natural gas system
- Decrease fugitive methane emissions
- Reduce dependence on fossil natural gas

2. Cross-Sector Interactions

The energy sector interacts with nearly all sectors of the economy. Siting of power plants, including solar and wind facilities, and transmission and distribution lines has impacts on land use in California—be it conversion of agricultural or natural and working lands, impacts to sensitive species and habitats, or implications to disadvantaged, vulnerable, and environmental justice communities. Additionally, more compact development patterns reduce per capita energy demands, while less-compact sprawl increases them.

Further, efforts to reduce GHG emissions in the transportation sector include electrification. This will increase demand for this sector.

In addition, water is used in various applications in the energy sector, ranging in intensity from cooling of turbines and other equipment at power plants to cleaning solar photovoltaic panels. Given California's historic drought, water use for the electricity sector is an important consideration for operation, maintenance, and construction activities.

Continued planning and coordination with federal, state, and local agencies, governments, tribes, and stakeholders will be crucial to minimizing environmental and health impacts from the energy sector, deploying new technologies, and identifying feedstocks.

3. Known Commitments and Potential New Measures to Reduce Greenhouse Gases

The measures below include some required and new potential measures to help achieve the State's 2030 target and to support the high level objectives for this sector. Some measures may be designed to directly address GHG reductions, while others may result in GHG reductions as a co-benefit.

Known Commitments - Electricity

- Per SB 350, with respect to Integrated Resource Plans, establish GHG planning targets for the electricity sector and each load-serving entity.
- Per SB 350, ensure meaningful GHG emission reductions by load-serving entities through Integrated Resource Planning.
- Per AB 197, prioritize direct reductions at large stationary sources, including power-generating facilities.

- Per SB 350, increase the RPS to 50 percent of retail sales by 2030 and ensure grid reliability.
- Per SB 350, efforts to evaluate, develop, and deploy regionalization of the grid and integration of renewables via regionalization of the California Independent System Operator (CAISO) should continue while maintaining the accounting accuracy and rigor of California's greenhouse gas policies.
- Per SB 350, establish annual targets for statewide energy efficiency savings and demand reduction that will achieve a cumulative doubling of statewide energy efficiency savings in electricity and natural gas end uses by 2030.
- Per SB 350, conduct and publish studies on barriers to, and recommendations on how to increase, access to renewable energy generation for low-income customers, energy efficiency and weatherization investments for low-income customers, and contracting opportunities for local small business in disadvantaged communities.
- Continue implementation of the Regulations Establishing and Implementing a Greenhouse Gases Emission Performance Standard for Local Publicly Owned Electric Utilities as required by SB 1368 (Perata, Chapter 598, Statutes of 2006), which effectively prohibit electric utilities from making new long-term investments in high-GHG emitting resources such as coal power.
- Per AB 802, adopt the forthcoming CEC regulations governing building energy use data access, benchmarking, and public disclosure.
- Per AB 2868, encourage development of additional energy storage capacity on the distribution system.
- Per AB 758, implement recommendations under State jurisdiction included in the AB 758 Action Plan developed by the CEC.

Known Commitments – Natural Gas

- Adopt the forthcoming ARB Proposed Regulation for Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities to reduce fugitive methane emissions from storage and distribution infrastructure.
- Per SB 1371, adopt improvements in investor owned utility (IOU) natural gas systems to address methane leaks.
- Implement the SLCP Strategy to reduce natural gas leaks from oil and gas wells, pipelines, valves, and pumps to improve safety, avoid energy losses, and reduce methane emissions associated with natural gas use.
- Per SB 1383, adopt regulations to reduce methane emissions from livestock manure and dairy manure management operations by up to 40 percent below 2013 levels by 2030, including establishing energy infrastructure development and procurement policies needed to encourage dairy biomethane projects. The regulations will take effect on or after January 1, 2024, if ARB determines the regulations are technologically and economically feasible and cost effective.
- Per SB 887, initiate continuous monitoring at natural gas storage facilities and (by January 1, 2018) mechanical integrity testing regimes at gas storage wells, develop regulations for leak reporting, and require risk assessments of potential leaks for proposed new underground gas storage facilities.

- Per SB 1383, CEC will develop recommendations for the development and use of renewable gas as part of its 2017 Integrated Energy Policy Report (IEPR).
- Per Public Utility (PU) Code 454.56, the CPUC, in consultation with CEC, (1) identifies all potentially achievable cost-effective natural gas efficiency savings and establishes gas efficiency targets for the gas corporation to achieve, and (2) requires gas corporations to first meet unmet resource needs through available natural gas efficiency and demand reduction resources that are cost effective, reliable, and feasible (PU Codes 890-900 provide public goods charge funding authorization for these programs).

Sector Measures

- Adopt a post 2020 Cap-and-Trade Program that covers the energy sector.
- Implement SB 185 (De Leon, Chapter 605, Statutes of 2015), which requires the California Public Employees' Retirement System (CalPERS) and the California State Teachers' Retirement System (CalSTRS) to sell their holdings in coal-producing companies by June 1, 2017, and explore extending requirements for additional fossil-fuel assets.

Potential New Measures

The potential new measures under consideration below have the potential to reduce GHGs, but may have legal, technological, feasibility, cost, and regulatory barriers that make them difficult or impossible to deploy in the near term.

- Develop clear and feasible rules needed for the development of electricity storage technologies.
- Adopt Zero Net Energy (ZNE) standard for residential buildings by 2018/2019, and for commercial buildings by 2030.
- Expand State Low-Income Weatherization Program (LIWP) to continue to improve energy-efficiency and weatherize existing residential buildings, particularly for low-income individuals and households.
- Decrease usage of fossil natural gas through a combination of energy efficiency programs, fuel switching, and the development and use of RNG in the residential, commercial, and industrial sectors.
- Accelerated deployment of heat pumps.
- Enhanced energy efficiency (high efficiency air conditioners, LEDs lamps, efficiency improvement industrial process cooling and refrigeration, efficient street lighting).
- Per AB 33, consider large-scale storage.
- Support more compact development patterns to promote reduced per capita energy demand (see transportation sector for specific policy recommendations).
- Establish target dates and pathways for a zero carbon building State policy.
- Form a multi-agency and stakeholder working group to:
    - Compile literature review and evaluate research on zero carbon buildings;
    - Propose a definition for zero carbon buildings; and
    - Recommend target dates and pathways to implement policy.

B. Industry

California's robust economy, with the largest manufacturing sector in the United States, is supported by a variety of industrial sectors, some of which include cement plants, refineries, food processors, paper products, wineries, steel, industrial gases, entertainment, technology and software, aerospace, and defense. Recent data shows this sector accounts for approximately 21 percent of the State's GHG emissions, almost equal to the amount of GHG emissions from the electric power sector. Emissions in this sector are mainly due to fuel combustion and, in some industries, process-related emissions. As expected, changes in this sector strongly correlate with changes in the overall economy. For example, housing and construction growth usually increases demand for cement. Moving toward a cleaner economy and ensuring we meet the statewide targets requires us to address GHG emissions in this sector, which has the potential to provide local co-benefits in criteria pollutant and toxic air contaminant reductions in immediate surrounding locations, especially vulnerable communities. At the same time, we must ensure there is a smooth path to a cleaner future to support a resilient and robust economy with a strong job force, while recognizing there is a role for existing and new industries in this future.

GHG emissions in this sector have remained relatively flat for the last few years while the State's economy has continued to grow, meaning the GHG emissions to produce each dollar of gross standard product is decreasing. In 2015, this sector accounted for approximately 20 percent of the State's gross domestic product. In 2015, California industry exported $165.4 billion in merchandise.[36] Policies to address GHG emission reductions must continue to balance the State's economic well-being versus progress towards achieving the statewide limits.

As this sector is dominated by combustion-related emissions, policies and measures to supply cleaner fuels and more efficient technology are the key to reducing GHG emissions. Sectors, such as cement and glass, also have significant process emissions. There may be fewer opportunities to address process emissions, as those are related to chemical reactions and processes to meet safety, product-specific, or regulatory standards for the final products. Another important aspect for this sector is its role as the State transitions to a cleaner future. Infrastructure, including existing facilities and new facilities, can support the production of new technology to support the State's efforts to address GHGs. For example, existing refineries have an opportunity to move away from the production of fossil fuels and switch to the production of biofuels and clean technology. Another example of this type of switch to cleaner technology is Tesla's Fremont, California facility that was a former General Motors and Toyota factory. As the State addresses doubling of energy efficiency in existing buildings, there will be an increased demand for efficient lighting fixtures, building insulation, low-e[37] coatings for existing windows, or new windows – goods which could be produced in California. For this sector, there are three predominant in-State paths to reducing GHG

[36] www.trade.gov/mas/ian/statereports/states/ca.pdf
[37] Low-e coatings reduce the emissivity, or heat transfer, from a window to improve its insulating properties.

emissions. Those are fuel switching, energy efficiency improvements, or the relocation of production to outside the State. Carbon, capture and sequestration also offers a potential new, long-term path for reducing GHGs for large stationary sources.

AB 32 requires the State's climate policies to minimize emissions leakage. A relocation of production out of California would shift GHG emissions outside of the State and result in emissions leakage. It would also reduce the availability of associated jobs and may impact a local tax base, which supports local services such as mass transportation and social services, among others. Jobs and taxes are needed to support California residents, especially those that live in vulnerable communities. A resilient economy is also necessary to support our custodial responsibilities for our State parks and recreational areas. These iconic landscapes that define our identity see visitors from all over the nation and world support the tourism and associated service industry. The State is home to 279 parks and their caretaking relies on general and special funds supported by California residents. These funding sources are critical to protect our natural environment and keep it available for future generations.

The State has a long history of addressing health-based air pollutants in this sector. Many of the actions for addressing criteria pollutants and toxic air contaminants in the industrial sector are through California's local air pollution control and air quality management district (air district) stationary source permitting requirements to ensure progress towards achieving State and national ambient air quality standards. And many of the actions, such as use of Best Available Control Technology, have resulted in some co-benefits in the form of GHG reductions. The State must continue to strengthen its existing criteria and toxic air pollutant programs and relationships with local air districts to ensure all Californians have healthy, clean air. This is especially true in disadvantaged communities.

AB 32 directed several actions to be taken by ARB to address GHG emissions, such as early action measures, GHG reporting requirements for the largest GHG sources, among others. In response, the State has adopted regulations for high global warming potential (high-GWP) gases used in refrigeration systems and the semiconductor industry.[38] These regulations apply to specific GHGs and types of equipment that can be found across the economy. For example, high-GWP gases are found in refrigeration systems in large food processing plants and chemical and petrochemical facilities, among others.

The U.S. Environmental Protection Agency (U.S. EPA) has also enacted regulations to reduce hydrofluorocarbon (HFC) emissions by prohibiting high-GWP refrigerants in new retail food refrigeration equipment, and in chillers used for large air-conditioning applications. On the international level, the European Union F-gas regulations went into effect January 1, 2015, which prohibit high-GWP HFCs in new equipment and require a gradual phasedown in the production and import of HFCs. A similar HFC phasedown that would take place globally was the subject of international negotiations during the Montreal Protocol meeting in Rwanda from October 10-14, 2016. Those negotiations

[38] www.arb.ca.gov/cc/rmp/rmp.htm

resulted in an agreement that will phase down the use of HFCs and put the world on track to avoid nearly 0.5^{o} C of warming by 2100.

The State also has the first in the world economy-wide cap-and-trade program that applies to all large industrial GHG emitters, imported electricity, and fuel and natural gas suppliers. The Cap-and-Trade Program is a key element of California's GHG reduction strategy. The Cap-and-Trade Regulation establishes a declining limit on major sources of GHG emissions, and it creates a powerful economic incentive for major investment in cleaner, more efficient technologies. The Cap-and-Trade Program applies to emissions that cover about 80 percent of the State's GHG emissions. ARB creates allowances equal to the total amount of permissible emissions (i.e., the "cap") over a given compliance period. One allowance equals one metric ton of GHG emissions. Fewer allowances are created each year, thus the annual cap declines and statewide emissions are reduced over time. The increasing annual floor price for allowances and reduction in annual allowance budgets creates a steady and sustained pressure for covered entities to reduce their GHGs.

The Cap-and-Trade Program is designed to achieve the most cost-effective statewide GHG emission reductions; there are no individual or facility-specific GHG emission reduction requirements. Each entity covered by the Cap-and-Trade Regulation has a compliance obligation that is set by its GHG emissions over a compliance period, and entities are required to meet that compliance obligation by acquiring and surrendering allowances in an amount equal to their compliance obligation. Companies can also meet a limited portion of their compliance obligation by acquiring and surrendering offset credits, which are compliance instruments that are based on rigorously verified emission reductions that occur from projects outside the scope of the Cap-and-Trade Program. Like allowances, each offset credit is equal to one metric ton of GHG emissions. The program began in January 2013 and achieved a near 100 percent compliance rate for the first compliance period (2013-2014). Reported and verified emissions covered by the Cap-and-Trade Program have been below the cap throughout the first years of the Program.[39]

Allowances are issued by ARB and distributed by free allocation and by sale at auctions. Free allocation of allowances allows the State to compensate covered entities for potential trade exposure due to the cost of compliance with the program and address concerns of relocation of production out-of-State and resulting emissions leakage. Offset credits are issued by ARB to qualifying offset projects. Secondary markets exist where allowances and offset credits may be sold and traded among Cap-and-Trade Program participants. Facilities must submit allowances and offsets to match their annual GHG emissions. Facilities that emit more GHG emissions must surrender more allowances or offset credits, and facilities that can cut their emissions need to surrender fewer compliance instruments. Entities have flexibility to choose the lowest-cost approach to achieving program compliance; they may purchase allowances at auction, trade allowances and offset credits with others, or take steps to reduce emissions at

[39] www.arb.ca.gov/cc/reporting/ghg-rep/ghg-rep.htm

their own facilities. Proceeds from the sale of State-owned allowances at auction are placed into the Greenhouse Gas Reduction Fund.

It is important to note, that while the Cap-and-Trade Program is designed to reduce GHGs for the industrial sector, there are recommendations from the Environmental Justice Advisory Committee (EJAC or Committee) for the State to pursue more facility-specific GHG reduction measures to achieve potential local air quality co-benefits, and AB 197 directs ARB to prioritize direct reductions at large stationary sources. The Committee has expressed a strong preference to forgo the existing Cap-and-Trade Program and rely on prescriptive facility level regulations. It should be noted that GHG, criteria pollutant, and toxic air contaminant trends are not always correlated. In some situations, criteria pollutants may actually be produced by actions such as destruction of methane through combustion devices or remain unchanged when fossil natural gas is displaced with renewable natural gas in large boilers. Regardless, there remains a need to develop or enhance existing measures to address criteria and toxic air pollutants as those pose local air quality health issues for communities adjacent to industrial sources. To address these specific concerns, State and local agencies must continue to evaluate and implement measures that result in quantifiable reductions in criteria and toxic air pollutants.

1. Looking to the Future

This section outlines the high-level objectives and goals to reduce GHGs in this sector.

Goals

- Increase energy efficiency
- Increase fuel switching to non-fossil fuel
- Promote and support industry that provides products and clean technology needed to achieve the State's climate goals
- Create market signals for low carbon intensity products
- Maximize air quality co-benefits
- Support a resilient economy and strong job force
- Make California the epicenter for research, development, and deployment of technology needed to achieve a near-zero carbon future

2. Cross-Sector Interactions

There are clear, direct relationships between the industrial sector and other sectors that go beyond the economic support a strong economy provides. This sector could increase its use of renewable fuels such as biomethane, which would be sourced from landfills or dairies. Some industries could shift from raw materials to recycled materials to reduce waste and reduce GHG emissions associated with processing of raw materials. Addressing energy efficiency could reduce onsite heating, water, and fuel demand. Supporting mass-transit or ride share programs for employees would reduce VMT. Upgrading existing facilities or repurposing existing infrastructure instead of

construction of new facilities or infrastructure would support land conservation and smart growth goals.

3. Known Commitments and Potential New Measures to Reduce Greenhouse Gases

The measures below include some required and new potential measures to help achieve the State's 2030 target and to support the high level objectives for this sector. Some measures may be designed to directly address GHG reductions, while others may result in GHG reductions as a co-benefit.

Known Commitments

- International agreement to globally phasedown the production of HFCs were agreed upon at the October 2016 annual Montreal Protocol Meeting of Parties in Kigali, Rwanda
- Depending on level of future HFC emission reductions expected for California from this agreement, California may also: 1) consider placing restrictions on the sale or distribution of refrigerants with a GWP > 2500, and 2) consider prohibiting refrigerants with a GWP > 150 in new stationary refrigeration equipment and refrigerants with a GWP > 750 for new stationary air-conditioning equipment.

Sector Measures

- Adopt a post-2020 Cap-and-Trade Program.
- Continue and strategically expand research and development efforts to identify, evaluate, and help deploy innovative strategies that reduce GHG emissions in the industrial sector.
- Promote procurement policies that value low-carbon production to delivery options, including at the State and local government levels.
- Identify and remove barriers to existing grant funding for onsite clean technology or efficiency upgrades.
- Evaluate and implement prescriptive regulations to reduce GHG, criteria, and toxic air contaminant emissions in a cost-effective manner, focusing on the largest GHG emission sources, including power plants.

Potential New Measures

The potential new measures under consideration below have the potential to reduce GHGs, but may have legal, technological, feasibility, cost, and regulatory barriers that make them difficult or impossible to deploy in the near term.

- Further deployment of fuel cells using renewable fuels.
- Increased utilization of renewable natural gas.
- Partner with California's local air districts to effectively use best available retrofit control technology (BARCT) to achieve air quality and GHG reduction co-benefits at large industrial sources.
- Develop a regulatory accounting and implementation methodology for the implementation of carbon capture, and sequestration projects.

- Identify new funding for grants for onsite clean technology or efficiency upgrades.
- Develop an incentive program to install low-GWP refrigeration systems in retail food stores.

C. Transportation Sustainability

California's population is projected to grow to 50 million people by 2050. How and where the State grows will have important implications for all sectors of the economy, especially the transportation sector. Supporting this growth while continuing to protect the environment, developing livable and vibrant communities, and growing the economy is dependent on transitioning the State's transportation system to one powered by zero emission vehicles (ZEVs) and low carbon fuels and that offers other attractive and convenient low-carbon transportation choices, including safe walking and bicycling, and quality public transportation. Investments should consider California's diverse communities and provide accessible and clean travel options to all.

The transportation system in California moves people between home, work, school, shopping, recreation, and other destinations, and connects ports, industry, residential communities, commercial centers, educational facilities, and natural wonders.[40] California's vast transportation system includes roads and highways totaling more than 175,000 miles and valued at approximately $1.5 trillion, 500 transit agencies, 245 public-use airports, 12 major ports, as well as the nation's first high-speed rail system, now under construction.[41] Transportation infrastructure also includes sidewalks, bicycle paths, parking, transit stations and shelters, street trees and landscaping, signage, lighting, and other elements that affect the convenience, safety, and accessibility of transportation choices. Increasingly, technologies such as real-time, web- and mobile-enabled trip planning and ride sharing services, are changing how people travel. In the near future, autonomous and connected vehicles, and unmanned aerial systems are expected to be part of our transportation landscape and to transform the way that people and freight are transported.

Through effective policy design, the State has an opportunity to guide technology transformation and influence investment decisions with a view to mitigate climate and environmental impacts while promoting economic opportunities and community health and safety. The network of transportation technology and infrastructure, in turn, shapes and is shaped by development and land use patterns that can either support or detract from a more sustainable, low-carbon, multi-modal transportation future. Strategies to reduce GHG emissions from the transportation sector, therefore, must actively address not only infrastructure and technology, but also coordinated strategies to achieve development, conservation, and land use patterns that align with the State's GHG and other policy goals.

[40] Caltrans. California Transportation Plan 2040, February 2016. Available at: www.dot.ca.gov/hq/tpp/californiatransportationplan2040/final-draft-ctp2040/docs/ctp2040-final-draft.pdf
[41] Ibid.

Transportation also enables the movement of freight such as food, building materials, and other consumable products. The California freight system includes myriad equipment and facilities,[42] and is the most extensive, complex, and interconnected system in the country, with approximately 1.5 billion tons valued at $2.8 trillion shipped in 2015 to, through, and within California.[43] Freight-dependent industries accounted for over $740 billion of California's Gross Domestic Product and over 5 million California jobs in 2014.[44,45]

Transportation has a profound and varied impact on individuals and communities, including benefits such as economic growth, greater accessibility, and transport-related physical activity and consequences such as GHG emissions, smog-forming and toxic air pollutants, traffic congestion, and sedentary behaviors. The sector is the largest emitter of GHG emissions in California,[46] while air pollution from tailpipe emissions contributes to respiratory ailments, cardiovascular disease, and early death, with disproportionate impacts on vulnerable populations such as children, the elderly, those with existing health conditions (e.g., chronic obstructive pulmonary disease, or COPD), low-income communities, and communities of color.[47,48,49,50] Importantly, transportation costs are also a major portion of most Californian's household budgets.[51] Additionally, dependence on cars has a direct impact on levels of physical activity, which is closely linked to multiple health outcomes.

Fortunately, many measures that reduce transportation sector GHG emissions simultaneously present opportunities to bolster the economy, enhance public health, revitalize disadvantaged communities, strengthen resilience to disasters and changing climate, and improve Californians' ability to conveniently access daily destinations and nature, particularly for those who are not able to, or cannot afford to, drive. In addition, growing market demand for walkable, bikeable, and transit-accessible communities presents a significant opportunity to shift California's transportation systems toward a lower-carbon future while realizing significant public health benefits through increased levels of physical activity (i.e., walking and bicycling). In fact, transport-related physical activity could result in reducing risks from chronic diseases such as cardiovascular

[42] The freight system includes trucks, ocean-going vessels, locomotives, aircraft, transport refrigeration units, commercial harborcraft and cargo handling, industrial and ground service equipment used to move freight at seaports, airports, border crossings, railyards, warehouses, and distribution centers
[43] U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, V 4.1, 2016.
[44] U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Accounts. Available at: www.bea.gov/regional/index.htm, accessed March 11, 2016.
[45] State of California Employment Development Department, Labor Market Information by California Geographic Areas. Available at: www.labormarketinfo.edd.ca.gov/geography/lmi-by-geography.html, accessed March 21, 2016.
[46] California Air Resources Board (ARB). Mobile Source Strategy, May 2016. Available at: www.arb.ca.gov/planning/sip/2016sip/2016mobsrc.pdf
[47] Hoek, G., Krishnan, R. M., Beelen, R., Peters, A., Ostro, B., Brunekreef, B., & Kaufman, J. D. 2013. Long-term air pollution exposure and cardio-respiratory mortality: a review. Environmental Health, 12(1), 1.
[48] Friedman, M. S., Powell, K. E., Hutwagner, L., Graham, L. M., & Teague, W. G. 2001. Impact of changes in transportation and commuting behaviors during the 1996 Summer Olympic Games in Atlanta on air quality and childhood asthma. Jama, 285(7), 897-905.
[49] Bell, M. L., & Ebisu, K. 2012. Environmental inequality in exposures to airborne particulate matter components in the United States. Environmental health perspectives, 120(12), 1699.
[50] Morello-Frosch, R., Zuk, M., Jerrett, M., Shamasunder, B., & Kyle, A. D. 2011. Understanding the cumulative impacts of inequalities in environmental health: implications for policy. Health affairs, 30(5), 879-887.
[51] htaindex.cnt.org/

disease, diabetes, certain cancers, and more, to such an extent that it would rank among the top public health accomplishments in modern history, and help to reduce the billions of dollars California spends each year to treat chronic diseases.[52] Just as California was the first to mitigate the contribution of cars and trucks to urban smog, it is leading the way toward a clean, low-carbon, healthy, interconnected, and equitable transportation system.

Continuing to advance the significant progress already underway in the areas of vehicle and fuel technology is critical to the transportation sector strategy and to reducing GHG emissions in the transportation sector. The rapid technological and behavioral changes underway with autonomous and connected vehicles, unmanned aerial systems, and ride-sharing services are redefining the transportation sector, and should be part of the solutions for a lower carbon transportation sector. It is critical to support and accelerate progress on transitioning to a zero carbon transportation system. The growing severity of climate impacts, persistent public health impacts and costs from air pollution,[53] and rapid technology progress that supports the expectation that cost parity between some ZEVs and comparable internal combustion vehicles will be attained in a few years, underscores the need for further action on ZEVs. Therefore, ARB solicits input on additional policies to move toward a goal of achieving 100 percent ZEV sales in the light-duty vehicle sector. Austria, Germany, India, Netherlands, and Norway are all taking steps or have indicated a desire to move to 100 percent ZEV sales in the 2020-2030 timeframe.

In addition, policies that maximize the integration of electrified rail and transit to improve reliability and travel times, increase active transportation, improve freight efficiency and infrastructure development, and shift demand to alternate, low-carbon modes will need to play a greater role as California strives to achieve its 2030 and 2050 climate targets.[54]

While the majority of the GHG reductions from the transportation sector in this Discussion Draft will come from technologies and low carbon fuels, a reduction in the growth of VMT is also needed. VMT reductions are necessary to achieve the 2030 target and must be part of any strategy evaluated in this plan. Stronger SB 375 GHG reduction targets will enable the State to make significant progress towards this goal, but alone will not provide all of the VMT growth reductions that will be needed. There is a gap between what SB 375 can provide and what is needed to meet the State's 2030 and 2050 goals. More needs to be done through continued land use changes, synergies with emerging mobility solutions like ridesourcing, and changes in travel behavior, especially among millennials.

[52] For a more detailed discussion on the health co-benefits of active transportation, and other health impacts of the transportation sector, please refer to the Transportation Systems section in Appendix J: Public Health Analysis (to be released in early 2017).
[53] For example, a recent report by the American Lung Association estimates the costs of climate and air pollution from passenger vehicles in California to be $15 billion annually.
Holmes-Gen, B. and Barrett, W. 2016. Clean Air Future – Health and Climate Benefits of Zero Emission Vehicles. American Lung Association in California, October.
[54] Morello-Frosch, R., Zuk, M., Jerrett, M., Shamasunder, B., & Kyle, A. D. 2011. Understanding the cumulative impacts of inequalities in environmental health: implications for policy. Health affairs, 30(5), 879-887.

In September 2016, the Administration released a discussion document entitled "Vibrant Communities and Landscapes"[55] that set out potential actions that can be taken in parallel to SB 375 Sustainable Community Strategies by State government, regional planning agencies, and local governments, to achieve a broad, statewide vision for more sustainable land use. The document "Potential VMT Reduction Strategies for Discussion" in Appendix G (to be released early 2017) further details State-level strategies that could be employed to close the VMT gap.[56] Discussions among a broad suite of stakeholders from the building community, financial institutions, housing advocates, environmental organizations, and community groups to develop over the coming months and years, a set of strategies will be developed to ensure that we can achieve necessary VMT reductions, and that the associated benefits are shared by all Californians.

At the State level, a number of important policies are being developed. Governor Brown signed Senate Bill 743 (Steinberg, 2013), which called for an update to the metric of transportation impact in the California Environmental Quality Act (CEQA). That update to the CEQA Guidelines is currently underway. Employing VMT as the metric of transportation impact statewide will help ensure GHG reductions planned under SB 375 will be achieved through on-the-ground development, and will also play an important role in creating the additional GHG reductions needed beyond SB 375 across the State. Implementation of this change will rely, in part, on local land use decisions to reduce GHG emissions associated with the transportation sector, both at the project level, and in long-term plans (including general plans, climate action plans, specific plans, and transportation plans) and supporting sustainable community strategies developed under SB 375. The State can provide guidance and tools to assist local governments in achieving those objectives

1. Looking to the Future

This section outlines the high-level objectives and goals to reduce GHGs in this sector.

Vibrant Communities and Landscapes / VMT Reduction Goals

- Update CEQA metric of transportation impact from level of service (LOS) to VMT statewide
- Promote all feasible policies to reduce VMT, including:
  - Land use changes and community design that reduce VMT,
  - Transit oriented development,
  - Street design policies that prioritize transit, biking and walking, and
  - Increasing low carbon mobility choices, including improved access to viable and affordable public transportation and active transportation options.

[55] Governor's Office of Planning and Research, et al. *Vibrant Communities and Landscapes: A Vision for California in 2050*. Draft for Comment & Discussion. September 2016. Available at: www.arb.ca.gov/cc/scopingplan/meetings/091316/vibrant%20communities.pdf

[56] www.arb.ca.gov/cc/scopingplan/meetings/091316/Potential%20VMT%20Measures%20For%20Discussion_9.13.16.pdf

- Continue construction of high-speed rail integrated with other rail and transit systems throughout the state.
- Promote alternative transportation fuel system infrastructure.
- Increase inviting biking and walking facilities to increase use.
- Promote potential efficiency gains from autonomous transportation systems and identify policy priorities to maximize sustainable outcomes from autonomous vehicles (preferably ZEVs), including VMT reduction, coordination with transit, and shared mobility.
- Promote shared-use mobility, such as bike sharing, car sharing and ridesharing services to bridge the "first mile, last mile" gap between commuters' transit stops and their destinations.
- Continue research and development on transportation system infrastructure, including:
  - Integrate frameworks for lifecycle analysis of GHG emissions with life cycle costs for pavement and large infrastructure projects, and
  - Health benefits and costs savings from shifting from driving to walking, bicycling and transit use.
- Quadruple the proportion of trips taken by foot by 2030 (from a baseline of the 2010-2012 California Household Travel Survey)
- Strive for a 9-fold increase in the proportion of trips taken by bicycle by 2030 (from a baseline of the 2010-2012 California Household Travel Survey)

Vehicle Technology Goals

- Through a strong set of complementary policies – including reliable incentives, significant infrastructure investment, broad education and outreach, and potential regulation – aim to reach 100 percent ZEV sales.
- Make significant progress in ZEV penetrations in non-light-duty segments.

Clean Fuels Goals

- Electrify the transportation sector using both electricity and hydrogen.
- Promote research, development, and deployment of low carbon fuels such as RNG and Renewable Hydrogen.
- Rapidly reduce carbon intensity of existing liquid and gaseous transportation fuels.

Sustainable Freight Goals

- Increase freight system efficiency of freight operations at specific facilities and along freight corridors such that more cargo can be moved with fewer emissions.
- Accelerate use of clean vehicle and equipment technologies and fuels of freight through targeted introduction of zero emission or near-zero emission (ZE/NZE) technologies, and continued development of renewable fuels.
- Encourage State and federal incentive programs to continue supporting zero and near-zero pilot and demonstration projects.
- Accelerate use of clean vehicle and equipment technologies and fuels of freight through targeted introduction of ZE/NZE technologies, and continued

development of renewable fuels. This includes developing policy options that encourage ZE/NZE vehicles on primary freight corridors (e.g., I-710); examples of such policy options include a separated ZE/NZE freight lane, employing market mechanisms such as favorable road pricing for ZE/NZE vehicles, and developing fuel storage and distribution infrastructure along those corridors.

2. Cross-Sector Interactions

The transportation sector has considerable influence on other sectors and industries in the State. California's transportation sector is still primarily powered by petroleum, and to reduce statewide emissions, California must reduce demand for driving; continue to reduce its gasoline and diesel fuel consumption; diversify its transportation fuel sources by increasing the adoption of low- and zero-carbon fuels; increase the ease and integration of the rail and transit networks to shift travel; and deploy ZE/NZE vehicles.

As California's population continues to increase, the location and types of future land use development will directly impact GHG emissions from the transportation sector, as well as those associated with the conversion and development of previously undeveloped land. Specifically, where and how the State population grows will have implications on distances traveled and tailpipe emissions; as well as "secondary" emissions from the transportation sector, including emissions from vehicle manufacturing and distribution, fuel refining and distribution, demand for new infrastructure (including roads, transit, and active transportation infrastructure), demand for maintenance and upkeep of existing infrastructure, and conversion of natural and working lands, with the attendant impacts to food security, watershed health, and ecosystems. None of these "secondary" emissions are currently accounted for in the current GHG models used in this Discussion Draft, but are nonetheless important considerations. Additionally, compact, lower-VMT future development patterns are essential to achieving the State's GHG reduction, public health, equity, economic, and conservation goals, which are also not modeled but are important co-benefits of the overall transportation sector strategy.[57]

Achieving LCFS targets and shifting from petroleum dependence toward greater reliance on low-carbon fuels has the potential to impact land use in multiple ways. For example, increased demand for conventional biofuels could require greater use of land and water for purpose-grown crops, which includes interactions with the agricultural and natural and working lands sectors. On the other hand, continuing growth in fuels from waste biomass such as by-processing residues and agricultural waste and excess forest biomass, acts to alleviate the pressure on croplands to meet the need for food, feed, and fuel. Likewise, captured methane from landfills or dairy farms for use in vehicles requires close interaction with the waste and farming sectors. Also, as more electric vehicles and charging stations are deployed, drivers' charging behavior will affect the extent to which additional electric generation capacity and ancillary services are needed to maintain a reliable grid and accommodate a portfolio of 50 percent

[57] Please refer to the Land Use and Transportation Systems sections in Appendix J: Public Health Analysis for additional information about the health co-benefits of transportation and land use measures for mitigating climate change (to be released in early 2017).

renewable electricity by 2030. Charging control and optimization technologies will determine how well integrated the electric and transportation sectors can become, including, for instance, the widespread use of electric vehicles as storage for excess renewable generation. The GHG emissions intensity of electricity impacts the GHG savings of fuel switching from petroleum-based fuels to electricity; the cleaner the electric grid, the greater the benefits of switching to electricity as a fuel. Hydrogen fuel cell vehicles can help expand renewable energy production and may require additional electric generation capacity to accommodate the energy demand associated with hydrogen production and may require more fuel storage and pipeline infrastructure.

3. Known Commitments and Potential New Measures to Reduce Greenhouse Gases

The measures below include some required and new potential measures to help achieve the State's 2030 target and to support the high level objectives for this sector. Some measures may be designed to directly address GHG reductions, while others may result in GHG reductions as a co-benefit.

Known Commitments – Vibrant Communities and Landscapes / VMT Reduction Goals

- Mobile Source Strategy – VMT reduction of 15 percent by 2050 (with measures to achieve this goal not specified; potential measures identified in Appendix G)
- Work with regions to update SB 375 Sustainable Communities Strategies targets for 2035 to better align with the 2030 GHG target and take advantage of State rail investments.
- AB 2722 – Implement Transformative Climate Communities Program, ensuring promotion of GHG reductions from neighborhood-level community plans in disadvantaged communities.
- Stabilize transportation funding so investments are available to develop sustainable and well-maintained transportation networks in California.
- SB 743 – complete the update to CEQA metric of transportation impact such that it promotes GHG reduction, the development of multimodal transportation networks, and a diversity of land uses.
- Streamline CEQA compliance and other barriers to infill development.
- Complete the pilot road usage charge program pursuant to SB 1077 and evaluate deployment of a statewide program.
- Continue promoting active transportation pursuant to SB 99 – The Active Transportation Program and beyond.
- Continue to build high-speed rail and broader statewide rail modernization pursuant to the funding program in SB 862 and other sources.
- Encourage use of streets for multiple modes of transportation including public transit, active transportation, such as walking and bicycling, as well as for all users, including the elderly, young, and less able bodied, pursuant to AB 1358 – Complete Streets policies.
- Accelerate deployment of alternative fueling infrastructure pursuant to:
    - SB 350 – CPUC to accelerate widespread transportation electrification,

    - Executive Order B-16-2012 and 2016 ZEV Action Plan – call for infrastructure to support 1 million ZEVs by 2020,
    - CEC's Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP),
    - CPUC's NRG settlement,
    - 2016 California Green Building Standards Code (CALGreen) provisions, and
    - IOU electric vehicle charging infrastructure pilot programs.
- Support and assist local and regional governments, through grant programs and technical assistance, to develop and implement plans that are consistent with the goals in "Vibrant Communities and Landscapes," including:
    - AB 2722 – Implement transformative climate communities program, ensuring promotion of GHG reductions from neighborhood-level community plans in disadvantaged communities,
    - AB 2087,
    - High speed rail station area plans, and
    - Implementation of updated General Plan Guidelines.
- Per SB 350, conduct and publish a study on barriers to, and recommendations on how to increase, access to ZE/NZE transportation options for low-income customers

Known Commitments – Vehicle Technology

- Implement the Cleaner Technology and Fuels Scenario of ARB's Mobile Source Strategy, which includes:
    - 4.3 million zero emission and plug-in hybrid light-duty electric vehicles by 2030,
    - Phase 1 and 2 GHG regulations for medium- and heavy-duty trucks,
    - Advanced Clean Cars program, and
    - Advanced Clean Transit.
- Periodically assess and promote cleaner fleet standards.
- Deploy ZEVs across all vehicle classes, including rail vehicles.
- Encourage State and federal incentive programs to continue supporting zero and near-zero pilot and demonstration projects.
- Encourage inclusion of supporting infrastructure, such as vehicle chargers, in residential garages and commercial parking structures.
- Collaborate with the U.S. Environmental Protection Agency to promulgate more stringent locomotives requirements, work with California seaports, ocean carriers, and other stakeholders to develop the criteria to incentivize introduction of Super-Low Emission Efficient Ships, and investigate potential energy efficiency improvements for transport refrigeration units and insulated truck and trailer cargo vans.
- Promote research, development, and deployment of new technology to reduce GHGs, criteria pollutants, and toxics.

Known Commitments – Clean Fuels

- LCFS with increasing stringency.

- Continue to develop and commercialize clean transportation fuels through renewable energy integration goals, tax incentives, research investments, support for project demonstration, public outreach, and State procurement contracts.
- Per SB 1383 and the Short-Lived Climate Pollutant Strategy, adopt regulations to reduce and recover methane from landfills, wastewater treatment facilities, and manure at dairies, use the methane as a renewable source of natural gas (RNG) to fuel vehicles and generate electricity, and establish infrastructure development and procurement policies to deliver RNG to market.

Known Commitments – Sustainable Freight

- Implement the California Sustainable Freight Action Plan:
    - 25 percent improvement of freight system efficiency by 2030
    - Deployment of over 100,000 freight vehicles and equipment capable of zero emission operation, and maximize near-zero emission freight vehicles and equipment powered by renewable energy by 2030

Sector Measures

- Post-2020 Cap-and-Trade Program

Potential New Measures

The potential new measures below are known to reduce GHGs, but may have technology, cost, or statutory barriers that may need to be addressed before they can be deployed in the near term.

- Develop a set of complementary policies to make light-duty ZEVs clear market winners, with a goal of reaching 100 percent light-duty ZEV sales. This could include:
    - Reliable purchase incentives for at least 10 years;
    - Dealer incentives for ZEV sales;
    - Policies to ensure operating cost savings for ZEVs relative to internal combustion engines, including low cost, and potentially free, electricity;
    - Significant investments in charging and ZEV refueling infrastructure;
    - A broad and effective marketing and outreach campaign;
    - Collaborations with cities to develop complementary incentive and use policies for ZEVs; and
    - Targeted policies to support ZEV sales and use in low income and disadvantaged communities.
- Develop Low Emission Diesel Standard to diversify the fuel pool by incentivizing increased production of low-emission diesel fuels. This standard would require incremental progress toward a goal of Low-Emission Diesel comprising 50 percent of the on-and off-road diesel sold in-State by 2030
- Stabilize transportation funding so investments are available to develop sustainable and well-maintained transportation networks in California.
- Continue to develop and explore pathways to implement State-level VMT reduction strategies, such as those outlined in the document “Potential State-

Level Strategies to Advance Sustainable, Equitable Communities and Reduce Vehicle Miles of Travel (VMT) -- for Discussion"[58] – included in Appendix G (also to be included in early 2017 release) – through a transparent and inclusive interagency policy development process to evaluate and identify implementation pathways for additional policies to reduce VMT and promote sustainable communities, with a focus on:

  - Accelerating equitable and affordable transit-oriented and infill development through new and enhanced financing and policy incentives and mechanisms
  - Promoting stronger boundaries to suburban growth through enhanced support for sprawl containment mechanisms such as urban growth boundaries and transfer of development rights programs
  - Identifying performance criteria for transportation and other infrastructure investments to ensure alignment with GHG reduction goals and other State policy priorities and expand access to transit, shared mobility, and active transportation choices
  - Promoting efficient development patterns that maximize protection of natural and working lands
  - Developing pricing mechanisms such as road user/VMT-based pricing, congestion pricing, and parking pricing strategies
  - Reducing congestion and related GHG emissions through commute trip reduction strategies, and
  - Programs to maximize the use of alternatives to single-occupant vehicles, including bicycling, walking, transit use, and shared mobility options.

- Take into account the current and future impacts of climate change when planning, designing, building, operating, maintaining and investing in State infrastructure.

D. Natural and Working Lands Including Agricultural Lands

California's natural and working lands encompass a range of land types and uses including farms, ranches, forests, grasslands, deserts, wetlands, riparian areas, coastal areas and the ocean as well as the green spaces in urban and built environments. These lands provide significant environmental and public health benefits to the State, support clean air, wildlife and pollinator habitat, and strong economies. They are home to the largest and most diverse sources of food and fiber production and renewable energy in the United States. And, they are the foundation of the State's water supply, with more than two-thirds of California's water supply originating in the Sierra Nevada.[59]

Policy in this sector must balance carbon sequestration with other co-benefits. California's climate objective for natural and working lands is to maintain them as a carbon sink (i.e., net zero or even negative GHG emissions) and minimize the net GHG and black carbon emissions associated with management, biomass disposal, and

[58] Refers to the document discussed at the September 2016 Public Workshop on the Transportation Sector to Inform Development of the 2030 Target Scoping Plan Update, also available at: www.arb.ca.gov/cc/scopingplan/meetings/091316/Potential%20VMT%20Measures%20For%20Discussion_9.13.16.pdf

[59] www.sierranevada.ca.gov/our-region/ca-primary-watershed

wildfire events. The State's lands, as well as sub-tidal waters, can be both a source and sink for GHG emissions. The carbon contained in vegetation, and soils represents the accumulated exchange of carbon between the land surface and the atmosphere.

For the past few years ARB has worked extensively with other State agencies, academic researchers and the public to quantify the individual components of the natural and working lands (NWL) inventory. Recent work has focused on estimating the 2001-2010 total carbon and carbon fluxes for forests in California. The initial results from this work show that, for 2010, California's natural lands contained an estimated 898 $MMTCO_2e$ in above-ground live stock for all natural lands combined (forest, grasslands, wetlands and other natural lands), and an additional 1,603 $MMTCO_2e$ in additional pools included in the NWL inventory.[60] ARB continues to expand the scope of the inventory using the most recent data available and plans to update the forest component of the NWL (to include 2012 GHG emissions estimates) inventory next year, followed by emissions estimates for soil carbon, urban forestry, and croplands by mid-2018. There is work currently in progress that is applying airborne and space-based technologies to monitor forest health and quantify emissions associated with land-based carbon. Developments in the remote sensing field are rapid and technologies are maturing quickly. California and federal agencies are working with researchers and funding studies to enhance our understanding of the roles of forests and other lands in climate change.[61,62] ARB is continuously reviewing the latest science in this sector and is committed to working closely with other State agencies and the public to ensure a comprehensive review of the updates to the inventory is completed.

While not all of this stored carbon is in imminent danger of being emitted to the atmosphere, recent trends indicate that significant pools of carbon are at risk of reversal: an estimated 150 $MMTCO_2e$ was lost to disturbance over the period 2001-2010, with the majority – approximately 120 $MMTCO_2e$– lost through wildland fire. At the same time, the agricultural sector accounts for eight percent of the emissions in the statewide GHG inventory. While growing trees and other plants, and soil carbon sequestration, make up for some of these losses, climate change itself is expected to further stress many of these systems and significantly impact the ability of California's landscapes to maintain its carbon sink without proactive management. There are ways to slow and reverse this trend, in concert with other productive and ecological objectives of land use, and the State will continue to rely on best available science to promote those actions. These efforts can not only protect California's natural carbon stocks, they can also improve quality of life in urban and rural communities alike and increase the climate resilience of agricultural, forestry and recreational industries and the rural communities they support; the State's water supply; globally significant biodiversity; and the safety and environmental health of all who call California home.

In his 2015 State of the State address, Governor Brown established 2030 targets for GHG emission reductions and called for policies and actions to reduce GHG emissions

[60] ARB's forest and other natural lands inventory tables, methodology development publications, and a workshop presentation providing an overview of the inventory development are available at: www.arb.ca.gov/cc/inventory/sectors/forest/forest.htm
[61] Asner, G. et al. (2015) Progressive forest canopy water loss during the 2012–2015 California drought. PNAS 113.2: E249-E255
[62] Battles, J. et al. (in progress) Innovations in measuring and managing forest carbon stocks in California. Project 2C: 4th California Climate Change Assessment. Natural Resources Agency. resources.ca.gov/climate/fourth/

from natural and working lands, including forests, rangelands, farms, wetlands, and soils. This policy objective was codified through passage of SB 1386 (Wolk) in 2016. The 2030 Target Scoping Plan focuses renewed attention on California's natural and working lands and the contribution they make to meeting the State's long term goals for carbon sequestration, GHG reduction, and climate change adaptation.

Further, the January Proposed 2030 Target Scoping Plan will include an analysis of business-as-usual net carbon sequestration rates from natural and working lands, including forecasts to 2030 and 2050. This is being done outside of the PATHWAYS model used for the other sectors in the Discussion Draft through a research contract with Lawrence Berkeley National Laboratory that is managed by the California Natural Resources Agency (CNRA), as PATHWAYS does not include methods to evaluate this sector,. Additional 2030 and 2050 scenarios will assess the expected impact of a set of development, land protection, management, and restoration objectives on carbon sequestration and GHG emissions. Figures II-1 and II-2 present some initial results of this modeling, based on the draft policy scenarios presented here. These projections will be used to determine the difference between current carbon sequestration levels and expected statewide trajectory, and the statewide goal of net zero loss by 2030 and net sequestration by 2050, as well as the contributions from different land types and land management practices. This work will help guide near and long-term policies that the State should pursue to ensure net sequestration in our natural and working lands. This technical work will continue to be updated and refined after the 2030 Target Scoping Plan is adopted, to support implementation planning; model implementation scenarios to 2100 to better establish the response of natural and works lands to major climate change impacts such as increased temperature, drought, and wildfire. The business-as-usual statewide baseline emission projection and carbon sequestration results may also inform the accounting framework requirements set forth in SB 859.

1. Looking to the Future

This section outlines the high level objectives to reduce GHGs in this sector.

California's climate objective for natural and working lands is to maintain them as a resilient carbon sink (i.e., net zero or even negative GHG emissions) to 2030 and beyond, and minimize the net GHG and black carbon emissions associated with management, biomass disposal, and wildfire events to 2030 and beyond. This will include establishment of agriculture sector GHG emission reduction planning targets for the mid-term time frame and 2050.

Implementation will take many policy and program pathways, and is built on activities related to land protection; enhanced carbon sequestration; and innovative biomass utilization:

(1) **Protect** land from conversion to more intensified uses by increasing conservation opportunities and pursuing through local planning processes urban and infrastructure development patterns that avoid greenfield development; the latter is being done in coordination with transportation and infrastructure climate policy, as described in prior sections of this Discussion Draft.

(2) **Enhance** the resilience of and potential for carbon sequestration on those lands through management and restoration, and reduce GHG and black carbon emissions from wildfire and management activities. This includes expansion and management of greenspace in urban areas.
(3) **Innovate** resolution of biomass disposal needs such that excess agricultural and forest biomass can be used to advance statewide objectives for renewable energy and fuels (RPS and LCFS), wood product manufacturing, agricultural markets, and soil health, resulting in avoided GHG emissions relative to traditional disposal pathways. Activities in this space should serve to increase the resilience of rural communities and economies.

Recommended activities within these categories are discussed in greater detail below. Elements of this work are already being developed through several avenues, including the Forest Climate Action Team, the Healthy Soils Initiative, the State Coastal Conservancy's Climate Ready Program, and, at the project scale, various Greenhouse Gas Reduction Fund programs and the Air Resources Board's offsets program and more. Future work will identify and seek to fill gaps, and set a comprehensive and strategic path forward. Research is underway across agencies to advance the state of the science on natural and working lands carbon dynamics, including a number of projects within the 4th Climate Change Assessment.

2. Cross-Sector Interactions

Strategies that reduce GHG emissions or increase sequestration in the natural and working lands sector often overlap and have synergies with other sectors. This is most pronounced at intersections with land use, biomass utilization, and water.

Landowner, local, and regional decisions related to land use impact development patterns and associated natural and working land conversion rates; conversely, conservation activities can support infill-oriented regional development and related transportation needs. As discussed earlier, under SB 375, Sustainable Communities Strategies (SCSs) aim to link transportation, housing and climate policy to reduce per capita GHG emissions while providing a range of other important benefits for California residents. Some SCSs include policies, objectives or implementation measures relating to conservation and land protections, and urban greening.[63] Protecting natural and working lands that are under threat of conversion can promote infill development, reduce VMT, limit infrastructure expansion, and curb associated GHG emissions. An integrated vision for community development, land conservation and management, and transportation was presented at the 2030 Target Scoping Plan Workshop on September 14, 2016.[64] Agricultural and commercial timber operations produce biomass as both an objective (i.e., food and fiber) and a waste product. How this waste is utilized can either increase or decrease emissions associated with management and restoration activities, turn waste into usable products, and displace fossil fuels used in energy and transportation, contributing to SB 350 RPS requirements and LCFS.

[63] Livingston, Adam. Sustainable Communities Strategies and Conservation. January 2016. Available at: www.nature.org/ourinitiatives/regions/northamerica/unitedstates/california/sustainable-communities-strategies-and-conservation.pdf
[64] www.arb.ca.gov/cc/scopingplan/meetings/meetings.htm

California is investigating ways to transform how organic waste from the agricultural sectors is managed to meet emission reduction targets required by SB 1383[65], and to protect public health. Cross-sector synergies and complete waste inter-cycles result from conscientious treatment of these resources, including opportunities to improve soil health, increase renewable energy generation, and enhance market support for non-commercial products and waste. Productive utilization of dead and dying trees is a significant focus of the Governor's Tree Mortality Task Force, and efforts to resolve the current shortfall in utilization capacity is addressed in that State of Emergency Declaration as well as SB 859.

Natural and working lands stewardship is essential to securing the State's water supply along the entire supply chain, from protection and management of the forested headwaters to preserving retention function of mountain meadows, ensuring flows and habitat in the Delta and its tributaries, end use efficiencies in agricultural and urban uses, and groundwater infiltration and utilization statewide. For example, efforts to increase water and energy use efficiency of farming operations could support GHG emission reduction goals in the energy sectors. And improving forest health in the Sierra Nevada and other headwaters will protect water quality and availability, in alignment with the California Water Action Plan.

3. Potential Actions to Enhance Carbon Sequestration and Reduce Greenhouse Gases

As the State works to meet emission reduction goals, the agricultural sector can contribute by reducing emissions from production and by playing a role in cross-sectoral efforts to maximize the many benefits of natural and working lands.

Climate Smart Agriculture is an integrated approach to achieving greenhouse gas (GHG) reductions while also ensuring food security in the face of climate change. A suite of ready-to-implement voluntary practices, such as conserving agricultural land, carbon sequestration in agricultural soils, managing manure in dairies, and increasing the efficiency of on-farm water and energy use can achieve these goals across diverse agricultural systems. Climate-smart agriculture can support the Governor's 2030 GHG emission reductions goals of Protect, Enhance, and Innovate. Focus areas that can lead to reduced emissions and other co-benefits are discussed in the following paragraphs.

California agriculture accounts for eight percent of the State's GHG emission inventory. A large percentage of agricultural emissions are methane emissions from livestock manure management. The Short-Lived Climate Pollutant Reduction Strategy, authorized by Senate Bill 1383, sets forth a process through which methane emissions from manure management will be reduced by forty percent below 2013 levels by 2030. A variety of techniques will need to be employed in order to attain the best results for each specific farming operation. The achievement of this target will reduce the GHG emissions from the agricultural sector significantly.

[65] SB1383 (Lara, Chapter 396) requires a 50 percent reduction in anthropogenic black carbon emissions by 2030.

Another source of emissions from agriculture is nitrous oxide resulting from nitrogen fertilizer applications. Optimizing the rate, timing, placement and type of nitrogen fertilizers has significant potential to reduce nitrous oxide emissions. Switching from synthetic to organic nitrogen sources (such as cover crops and compost) can achieve net greenhouse gas reductions as well. Over the last several years steps have been taken to help farms optimize fertilizer applications to protect water quality, reduce nitrous oxide emissions and maintain high yields. Many farmers have been required to manage nitrogen fertilizers much more carefully to protect water quality through the use of nitrogen management plans. Additionally, California Department of Food and Agriculture's (CDFA's) Fertilizer Research and Education Program, in coordination with university researchers and others, has developed fertilization guidelines to optimize rate, timing and placement of fertilizers for crops that represent more than half of the irrigated agriculture in California. Similarly, innovations in water management and the expansion of high efficiency irrigation methods also are contributing to nitrous oxide reductions.

California's farms and ranches have the ability to remove carbon from the atmosphere through practices that build and retain soil organic matter. Adequate soil organic matter insures the soil's continued capacity to function as a vital living ecosystem with multiple benefits that sustains and produces food for plants, animals, and humans. The Healthy Soils Initiative, announced by Governor Brown in 2015, offers an opportunity to incentivize the management of farmland for increased carbon sequestration in soil, also augmenting co-benefits such as increased water-holding capacity and soil fertility and supporting biodiversity and integrated farming techniques. State and local efforts to manage land for carbon sequestration must work in conjunction with existing plans, incentives, and programs protecting California's water supply, agricultural lands, and wildlife habitat. The 2030 Target Scoping Plan fits within a wide range of ongoing planning efforts throughout the State to advance economic and environmental priorities associated with natural and working lands.

The land management targets outlined below are illustrative of the types of actions that will be necessary to maintain California's natural and working lands and urban greenspace as a net sink of carbon, and are being used to aid in development of the scenario modeling, both the Reference Scenario and "with-policy" scenarios. Once the carbon implications of these activities are established within that scenario modeling framework, the State and stakeholders can begin the process of more accurately scoping the scale of action needed to reach the carbon sequestration and GHG emission reduction targets.

a) Protection of Land and Land Use

California will continue to pursue development and new infrastructure construction patterns that avoid greenfield development and increase conservation opportunities for natural and working lands to reduce the rate of conversion to intensified uses. Success here will depend on working through local and regional land use planning and

permitting, as well as developing incentives for participation by local governments and individual landowners. Initial work to model the potential carbon sequestration outcomes of this type of development strategy and targeted conservation focused on two hypothetical scenarios of conservation/ avoided development: reductions in the rate of land conversion to developed use by 50 percent and 75 percent below business-as-usual rates by 2050. These two scenarios, labeled "low" and "high" protection, respectively, are illustrated in Figure ll-3.

b) Enhance Carbon Sequestration and Resilience through Management and Restoration

California will increase efforts to manage and restore land to secure and increase carbon storage and minimize GHG and black carbon emissions in a sustainable manner so that the carbon bank is resilient over time.

In order to better understand the potential carbon outcomes of this strategy, the initial modeling to be included in the 2030 Target Scoping Plan will consider a variety of management and restoration activities employed across the State. Two scenarios are considered, a "low" and a "high" rate of implementation to 2030, with resulting carbon sequestration outcomes to 2050. The acreages given in the "low" scenario all represent implementation above and beyond current rates for the listed activity, but that could be considered reasonably achievable if additional funding and other supporting resources are available. This applies to implementation on both private and public lands. Many of these goals can be accomplished through existing administrative structures. The "high" scenario includes more ambitious targets, and may entail new programs and policies, including additional coordination with federal partners, to support implementation. The results of these two scenarios are illustrated in Figure ll-4. The activities presented in Table II-2 below and included in initial modeling are not considered to be exhaustive of all activities that will be considered under this strategy. For example, an increase in urban tree canopy is included in the initial modeling exercise but urban greening initiatives are not expected to be limited to tree planting. State agencies seek input on the suite of activities to be considered under this strategy.

Table II-2. Land Management and Restoration Activities

Activity	Low Management	High Management
Forests - fuel reduction and restoration treatments on State and private lands	60,000 ac/yr through 2030	175,000 ac/yr through 2030
Forests – reforestation on State and private lands	Increase rate 15% above BAU by 2030	Increase rate 30% above BAU by 2030
Croplands – Healthy Soils-on-farm management activities that promote carbon sequestration	10,000 ac/yr through 2030	
Rangelands and Grasslands – mountain meadow restoration on State and private lands	10,000 acres by 2030	30,000 acres by 2030
Rangelands and Grasslands – Healthy Soils	10,000 ac/yr through 2030	
Wetlands – Managed Wetlands Restoration in the Sacramento-San Joaquin Delta	15,000 acres by 2030	30,000 acres by 2030
Wetlands – Coastal/ Tidal restoration statewide	30,000 acres by 2030	60,000 acres by 2030
Urban – Increase urban tree canopy statewide	20% above current by 2030	40% from current by 2030
Oceans – increase extent of eelgrass beds	5% above current levels by 2030	10% above current levels by 2030

c) Innovate Biomass Utilization Pathways

Excess biomass generated by commercial agricultural and forestry operations, as well as biomass produced through forest health and restoration treatments, must be disposed of in a manner that minimizes GHG and black carbon emissions. Achieving this will require diversion of this biomass to productive utilization pathways, such as production of renewable electricity and biofuels; commercial products including durable wood products, compost and other soil amendments, and animal feed and bedding; and other uses. Research, development and implementation activities underway in energy, wood products, and soil amendment fields should be evaluated for utility in meeting disposal needs on regional and community scales.

Figure II-1. Projected Carbon Sequestration Outcomes of Two Protection Scenarios

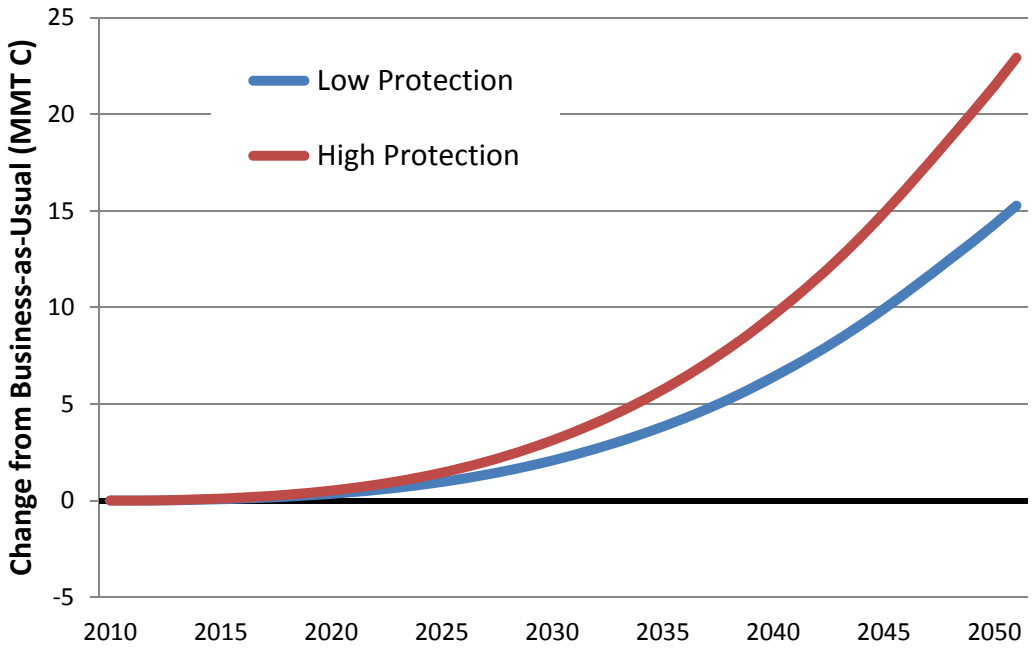
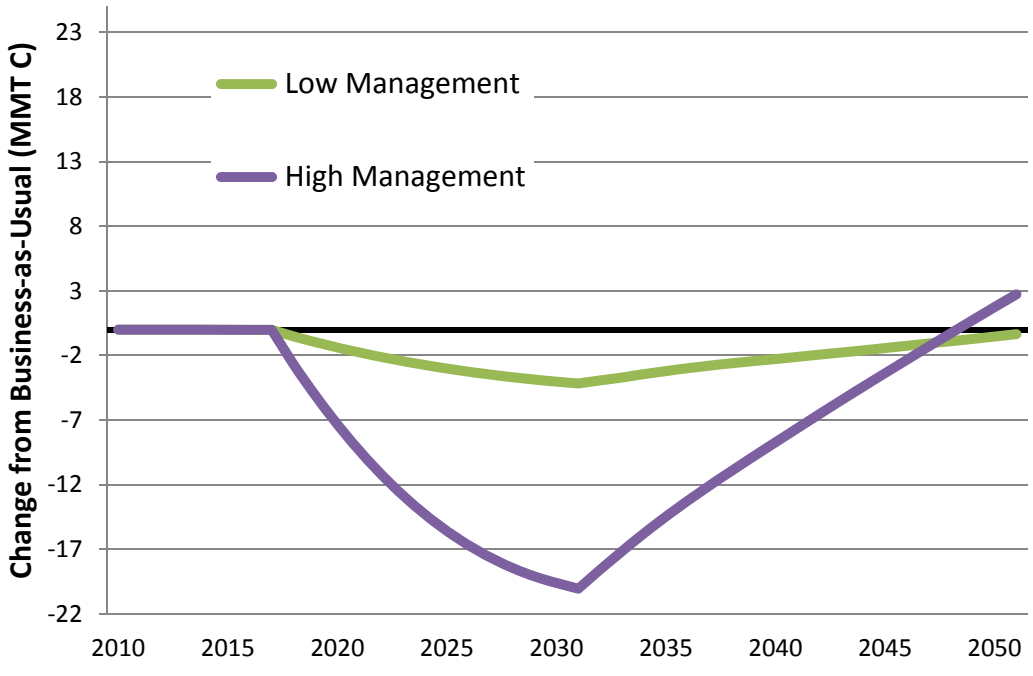


Figure II-2. Projected Carbon Sequestration Outcomes of Two Management Scenarios



Figures ll-1 and II-2 present the projected carbon sequestration outcomes of each of the four protection and management scenarios described above, relative to "business-as-usual," or Reference Scenario. The horizontal line extending from zero on the y-axis represents no change from current conservation or management actions, and the differences between this flat Reference Scenario and each of the conservation and management scenarios provide information on the carbon sequestration benefits of the proposed strategies. Both of the protection scenarios, as well as the "high" management scenario, are expected to result in carbon sequestration beyond that which would have been achieved through business-as-usual activities. Figure ll-4 does not include any results of biomass utilization strategies. The drop in carbon storage during treatment years (2017-2030) seen in both of the management scenarios is largely the result of forest biomass removal associated with fuel reduction and prescribed burn treatments. The results capture the expected increase in carbon sequestration rates on treated forest acres; the more aggressive management scenario results in a higher increase in the overall rate of forest carbon sequestration relative to both the business-as-usual and low management scenarios. The initial carbon loss visualized here represents the potential for innovative biomass utilization pathways to literally fill the gap – to use this land-based carbon to increase carbon stored in durable wood products and agricultural soils and offset use of fossil fuels consumed for electricity and fuels. This model output and other results of Lawrence Berkeley National Laboratory's initial modeling efforts will be discussed at upcoming public workshops.

Recommended measures under consideration to support the objectives for this sector are listed below.

Scoping and Tracking Progress

- Collaborate with other State agencies to ensure the initiatives below complement other 2030 Target Scoping Plan measures:
    - Expand the scope of lands targeted for carbon sequestration, building off of the Initial Scoping Plan goal for forest carbon sequestration (later codified in AB 1504) and the First Update's broader discussion of sequestration potential from agricultural and natural systems.
    - Identify implementation mechanisms to pursue protection and management at the necessary scale. These will be grounded in existing regulation, policy, and incentive structures wherever possible, and will include mandated programs, voluntary efforts, and state, local, regional and federal partnerships with the U.S. Forest Service and USDA Natural Resource Conservation Service, among others.
    - Identify the scale and scope of implementation for mechanisms that will be necessary for reducing GHG emissions and to achieve the goal of maintaining NWL as a carbon sink, as well as the resources and policy pathways available for implementation.
- Complete ARB's GHG emission inventory for natural and working lands, including estimates of black carbon emissions from natural and working lands, by December 30, 2018. Continue to refine the natural and working lands inventory based on input

from other State agencies, stakeholders, and academic experts. Complete a standardized accounting framework for forests and other natural lands, as described in SB 859, by December 30, 2018.
- Develop and implement a Healthy Soils Action Plan
- Develop and implement a Forest Carbon Plan
- Design planning and implementation for conservation and restoration strategies to be effective at the watershed or other regionally relevant large landscape scale.

Protect

- Promote and provide incentives for infill development through community revitalization and urban greening and support for permanent and temporary voluntary conservation of lands under threat of development, paired with stewardship plans where possible.
- Promote the adoption of regional transportation and development plans, such as SB 375 Sustainable Communities Strategies and Climate Action Plans that prioritize infill and compact development and also consider the climate change impacts of land use and management.
- Provide support and technical assistance for counties, cities and regions to integrate natural and working lands conservation priorities into plans, drawing from existing Natural Community Conservation Plans, Habitat Conservation Plans, the State Wildlife Action Plan, and critical agricultural lands. Partner with landowners, local and federal agencies and private conservation organizations to conserve critical lands.
- Promote on-farm and ranch management practices that sequester carbon or reduce GHG emissions.
- Coordinate State-funded land and easement acquisition and management among departments within the Natural Resources Agency, including the Department of Parks and Recreation, Department of Conservation, Department of Fish and Wildlife, Department of Forestry and Fire Protection, Department of Water Resources, Wildlife Conservation Board, Ocean Protection Council, and State Conservancies, to effectively leverage State resources to meet common goals.
- Support ocean management actions that result in protection of subtidal habitats such as eelgrass, to avoid loss of these systems.

Enhance

- Identify land use and management and restoration treatments that are expected to increase the resilience and/or level of carbon sequestration and reduce GHG and black carbon emissions, based on best available science.
- Engage local communities and private and public landowners to implement best practices for carbon sequestration to achieve net GHG benefits by undertaking actions that reduce on-farm GHG emissions, improve soil and biomass carbon sequestration, restore wetlands and other natural systems, or reduce the risk of wildfire. Support implementation with technical assistance.

- Research, development, and deployment of actions and initiatives for oceans and trophic systems to mitigate and adapt to climate change.
- Increase the use of green infrastructure in urban areas to enhance carbon sequestration potential in a manner that also results in co-benefits of energy efficiency of in the built environment and transportation systems, reduction of the urban heat island effect, improvement of water capture and storage and supports direct, long-lasting benefits to disadvantaged communities.
- Promote local and regional performance targets for mitigation of the Urban Heat Island (UHI) effect and provide technical support for identification and implementation of urban greening, building and transportation policies and programs to achieve it. Such a goal might take the form of reducing the UHI differential by 3°F degrees between urban core and surrounding rural areas, versus current UHI impacts in major metropolitan areas.[66]

Innovate

- Initiate an interagency initiative to identify, at the regional scale, the sources and volumes of excess agricultural and forest biomass and scope the need for disposal and utilization that will minimize GHG and black carbon emissions and align with statewide renewable energy and fuels policies, practices, and implementation programs; waste diversion goals; agricultural markets and the Healthy Soils Plan; and wood products markets and the Forest Carbon Plan.
- Scale bioenergy capacity to contribute significantly to meeting community and regional agricultural and forest biomass disposal needs over time, in a manner that protects public health. This includes accelerated build-out of the capacity mandated by SB 1122 and the procurement requirements contained in the Tree Mortality State of Emergency Declaration and SB 859.
- Develop recommendations and identify pilot projects to expand wood products markets, as per SB 859. Support research and development and pathways to market for wood products made from non-merchantable timber.

The following integrated measures are recommended for the agricultural sector:

- Employ a suite of ready-to-implement practices, such as increasing the efficiency of on-farm water and energy use, managing manure in dairies, and agricultural practices that increase net carbon sequestration and reduce GHG emissions across diverse agricultural systems.
- Utilizing existing reporting mechanisms, such as the Irrigated Lands Regulatory Program, identify metrics that can be tracked into the future to evaluate reductions in nitrous oxide emissions from fertilizing materials on California's agricultural lands.

[66] CalEPA's Urban Heat Island Index Maps acts as a tool to establish baselines for 31 urban areas. The Index is calculated as a positive temperature differential over time between an urban census tract and nearby upwind rural reference points at a height of two meters above ground level, where people experience heat - See more at:www.calepa.ca.gov/UrbanHeat/Index.htm#sthash.SZkxGYlA.dpuf. CalEPA concludes daytime temperatures in urban areas are on average 1-6° F higher than in rural areas, while nighttime temperatures can be as much as 22° F higher as the heat is gradually released from buildings and pavement. The U.S. Environmental Protection Agency (EPA) encourages cities to set quantitative goals. For example, the City of Los Angeles's The Sustainable City pLAn aims to reduce the temperature difference between the urban core and the surrounding rural areas by 1.7 °F by 2025 and 3.0°F by 2035.

- Further the development and calibration of quantification tools (Comet-Farm and others) and monitoring tools for agriculture to understand trends in practices (aerial imagery, mapping, and sampling).
- Continue to support research to understand emission factors from soils throughout California and to understand sequestration potential.
- Support research and development and pathways to market for dairy digesters, including pipeline injection and interconnection.
- Support research and development for non-digester dairy manure methane mitigation options including dry scrape, solids separation, converting to pasture-based systems, and other technologies to help meet ARB's proposed methane reduction goals on dairies.
- Per SB 1383, reduce methane emissions from livestock manure and dairy manure management operations, including establishing energy infrastructure development and procurement policies. The regulations will take effect on or after January 1, 2024, if ARB determines the regulations are technologically and economically feasible and cost effective.
- Support research and development for quantification of the methane emission reduction effectiveness of manure management technologies at dairies, including pilot projects.
- Increase the number of farms generating on-farm renewable energy (solar, wind, bioenergy, geothermal, etc.)

E. Waste Management

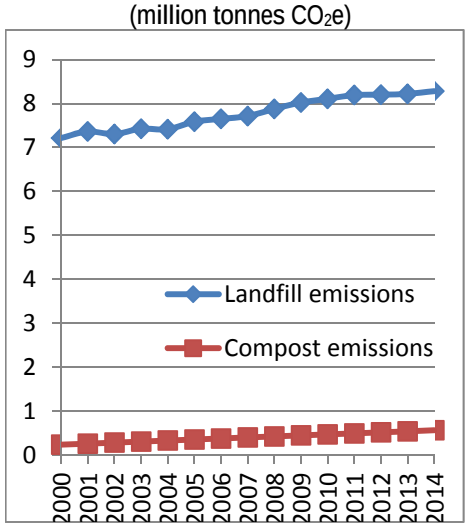
The waste management sector covers all aspects of solid waste[67] and materials management including reduction/reuse; recycling, and remanufacturing of recovered material; composting and in-vessel (anaerobic and aerobic) digestion; biomass management (chip and grind, composting, biomass conversion); municipal solid waste transformation; and landfilling. This sector also includes market development programs, such as the State's recycled-content product procurement program and a range of grant and loan programs. Data from CalRecycle's report, *2014 Disposal Facility-Based Characterization of Solid waste in California*, shows that materials, such as organics, that decompose in landfills and generate methane comprise a significant portion of the waste stream. Methane is a potent short-lived climate pollutant (SLCP) which has a global warming potential 25 times greater than that of carbon dioxide on a 100-year time horizon and more than 70 times greater than carbon dioxide on a 20-year time horizon.[68]

Within ARB's GHG Inventory, emissions from the waste management sector consist of methane and nitrous oxide emissions from landfills and from commercial-scale composting, with methane being the primary contributor to the sector's emissions. The

[67] In general terms, solid waste refers to garbage, refuse, sludges, and other discarded solid materials resulting from residential activities, and industrial and commercial operations. This term generally does not include solids or dissolved material in domestic sewage or other significant pollutants in water such as silt, dissolved or suspended solids in industrial wastewater effluents, dissolved materials in irrigation return flows or other common water pollutants.
[68] Intergovernmental Panel on Climate Change. 2007. Climate Change 2007: Working Group I: The Physical Science Basis. 2.10.2 Direct Global Warming Potentials. Fourth Assessment Report. www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html

sector emitted 8.85 MMTCO$_2$e in 2014, comprising approximately two percent of the State's GHG emissions.

Figure II-3. Emissions from Landfill and Compost
(million tonnes CO$_2$e)



Emissions from recycling and waste have grown by 19 percent since 2000 (Figure II-3).[69] The majority of those emissions are attributed to landfills, despite the majority of landfills having gas collection systems in place.[70] Landfill emissions account for 94 percent of the emissions in this sector, while compost production facilities make up a small fraction of emissions.[71] The annual amount of solid waste deposited in California landfills grew from 37 million tons in 2000 to its peak of 46 million tons in 2005, followed by a declining trend until 2009 when landfilled solid waste stabilized to relatively constant levels. Landfill emissions are driven by the total waste-in-place, rather than year-to-year fluctuation in annual deposition of solid waste, as the rate and volume of gas produced during decomposition depends on the characteristics of the waste and a number of environmental factors. As a result, waste disposed in a given year contributes to emissions that year and in subsequent years.

In addition to direct emissions, the reduction, reuse, and recycling of waste materials decreases upstream GHG emissions associated with the extraction and processing of virgin materials and their use in production and transport of products. Although many of these upstream GHG emissions happen outside of California, California's waste policies can reduce both local and global GHG emissions and create jobs within the State. While landfills are an effective and relatively safe way to manage some waste, disposal-centric activities result in squandering valuable resources and generate landfill gases as well as other risks. A large fraction of the organics in the waste stream can be diverted from landfills to composting or digestion facilities to produce beneficial products. Moreover, food waste is the largest component of organics disposed in landfills; a portion of this is edible and should be captured at its source and, for example, provided to food banks to feed people in need. A State waste management sector "loading order" should focus more attention on reducing how much waste we generate and recovering and recycling whatever resources we can, using landfills as a last resort.

Landmark initiatives like the Integrated Waste Management Act of 1989 (AB 939)

[69] Air Resources Board, 2016. Documentation of California's 2000-2014 GHG Inventory – Index. Last modified March 30, 2016. www.arb.ca.gov/cc/inventory/doc/doc_index.php
[70] Air Resources Board, 2013. California Greenhouse Gas Inventory for 2000-2013 – by Category as Defined in the 2008 Scoping Draft Plan (based upon IPCC Fourth Assessment Report's Global Warming Potentials).
[71] ARB, 2016. *2016 Edition California GHG Emission Inventory*. California Greenhouse Gas Emission Inventory: 2000-2014. Version June 17, 2016.

demonstrate California's efforts to build communities that consume less, recycle more, and take resource conservation to higher and higher levels. Statewide, Californians achieved a 49 percent recycling rate in 2014, and recycling programs support an estimated 75,000 to 115,000 green jobs in California. If California were to achieve a 75 percent statewide solid waste recycling rate by 2020—a goal set out by the Legislature in AB 341—by recycling and remanufacturing at in-State facilities, the State could potentially generate an additional 100,000 green jobs.[72] In addition to employment contributions, diversion of organic waste from landfills can generate positive environmental impacts. Compost from organic matter provides soil amendments to revitalize farmland, reduce irrigation and landscaping water demands; contribute to erosion control in fire-ravaged landscapes; and potentially increase long-term carbon storage in rangelands. Production and use of bioenergy in the form of biofuels and renewable natural gas has the potential to reduce dependency on fossil fuels for the transportation sector. For the energy sector, however, renewable natural gas faces significant safety, feasibility, and cost issues.

The State has a robust waste management system in place, with established programs that reduce air emissions through activities such as gas collection systems from landfills[73] and stringent recycling mandates. AB 939 required cities and counties to reduce the amount of waste going to landfills by 50 percent in 2000 and municipalities have nearly universally met this mandate. Californians dispose about 30 million tons of solid waste in landfills each year. To further reduce landfilled solid waste, the Legislature adopted AB 341 (Chesboro, Chapter 476, Statutes of 2011) to achieve more significant waste reductions by setting a goal that 75 percent of solid waste generated be reduced, recycled, or composted by 2020, and by mandating commercial recycling. AB 1826 (Chesboro, Chapter 727, Statutes of 2014) added requirements regarding mandatory commercial organics recycling. Additional description of existing programs is included in Appendix G (to be released in early 2017).

Although solid waste management has evolved over the last 27 years and diversion rates (which include more than recycling) have increased more than six-fold since 1989, if no further changes in policy are made, the State's growing population and economy will lead to higher amounts of overall disposal along with associated increases in GHG emissions. The pathway to reducing disposal and associated GHG emissions will require significant expansion of the composting, anaerobic digestion, and recycling manufacturing infrastructure in the State.

To help reduce GHG emissions by 40 percent below 1990 levels by 2030 and meet California's waste reduction goals, California's waste management sector strives to achieve in-State processing and management of waste generated in California. To carry out this vision, we must work with residents and producers to reduce the volume of waste generated overall and capitalize on technology and social changes that might

[72] "AB 341's 75 Percent Goal and Potential New Recycling Jobs in California by 2020," www.calrecycle.ca.gov/Publications/Documents/1463/20131463.pdf

[73] ARB approved a regulation to reduce methane from municipal solid waste landfills as a discrete early action measure under AB 32. The regulation became effective June 17, 2010. Additional information is available at: www.arb.ca.gov/regact/2009/landfills09/landfillfinalfro.pdf

enable waste reduction. Packaging comprises approximately 8 million tons of waste landfilled in California annually, or about one quarter of the State's total disposal stream. To reduce the climate change footprint of packaging, the State is promoting the inclusion of source reduction principles in packaging and product design; fostering recycling and recyclability as a front end design parameter for packaging and products that cannot be reduced; and encouraging recycling markets and market development for recycled-content products and packaging. CalRecycle is developing a packaging policy model containing components necessary for a mandatory comprehensive, statewide packaging program in California; this would need to be legislatively enacted to achieve a packaging reduction goal, such as 50 percent by 2030. CalRecycle is also continuing to work with stakeholder organizations and industry to explore complementary voluntary activities that have the potential to significantly decrease packaging disposal in California. In addition, large-scale shifts in materials management will be necessary, including steps to maximize recycling and diversion from landfills and build the necessary infrastructure to support a sustainable, low-carbon waste management system within California. Working together, State and local agencies will identify ways to increase the use of waste diversion alternatives and expanding potential markets, obtain funds and incentives for building the infrastructure and strengthening markets, and evaluate the need for additional research to achieve California's GHG reduction and waste management goals.

Recently adopted legislation outlines new opportunities and requirements to reduce GHG emissions from the waste sector, with a focus on reducing organic waste sent to landfills. SB 605 (Lara, Chapter 523, Statutes of 2014) requires that ARB develop a strategy to reduce SLCPs and SB 1383 (Lara, Chapter 395, Statutes of 2016) requires the Strategy to be implemented by January 1, 2018. ARB's Revised Proposed SLCP Strategy (November 2016) includes organic waste diversion targets for 2020 and 2025 consistent with SB 1383 to reduce methane emissions from landfills. It requires CalRecycle, in consultation with ARB, to adopt regulations to achieve statewide disposal targets to reduce landfilling of organic waste by: (1) 50 percent from the 2014 level by 2020, and (2) 75 percent from the 2014 level by 2025. Under SB 1383, of the edible food destined for the organic waste stream, not less than 20 percent is to be recovered to feed people in need by 2025. The regulations are to take effect on or after January 1, 2022, and CalRecycle, in consultation with ARB, must analyze the progress that the waste management sector, State government, and local government have made in achieving the 2020 and 2025 goals by July 1, 2020. Incorporating SB 1383 requirements, ARB's Final SLCP Strategy is expected to be presented to the Board for approval in the first quarter of 2017. It is estimated that the combined effect of the food waste prevention and rescue programs and organics diversion from landfills will reduce 4 $MMTCO_2e$ of methane in 2030 (using a 20-year GWP), but one year of waste diversion in 2030 is expected to result in a reduction of 14 $MMTCO_2e$ of emissions over the lifetime of waste decomposition.

1. Looking to the Future

This section outlines the high-level objectives and goals to reduce GHGs in this sector.

Goals

- Take full ownership of the waste generated in California
- View waste as a resource
- Develop a sustainable, low-carbon waste management system that processes collected waste within California and generates jobs
- Maximize recycling and diversion from landfills
- Reduce direct emissions from composting and digestion operations through improved technologies
- Build the infrastructure needed to support a sustainable, low-carbon waste management system within California
- Increase organics markets which complements and supports other sectors[74]
- Capture edible food before it enters the waste stream and provide to people in need
- Increase production of renewable transportation fuels from anaerobic digestion of waste
- Recognize the co-benefits of compost application

2. Cross-Sector Interactions

The waste management sector interacts with all of the other sectors of the State's economy. Reducing waste, including food waste, is key to reducing the State's overall carbon footprint. Additionally, replacing virgin materials with recycled materials reduces the energy and GHGs associated with the goods we produce and consume.

California leads the United States in agricultural production in terms of value and crop diversity. Soil carbon is the main source of energy for important soil microbes and is key for making nutrients available to plants. Waste-derived compost and other organic soil amendments support the State's Healthy Soils Initiative being implemented by CDFA. In addition, the use of compost to increase soil organic matter in the agricultural sector provides other benefits including reducing GHG emissions, conserving water, reducing synthetic (petroleum-based) fertilizer and herbicide use, and sequestering carbon.

3. Known Commitments and Potential New Measures to Reduce Greenhouse Gases

The measures below include some required and new potential measures to help achieve the State's 2030 target and to support the high-level objectives for this sector.

[74] Examples may include renewable energy (biogas to renewable transportation fuels or electricity); soils (application of organics to agricultural soils for building soil organic matter and conserving water; application of organics to mulch for erosion control; application of organics to rangelands for increased carbon sequestration); and forests (support use of forest residues for erosion control, stabilization of fire-ravaged lands).

Some measures may be designed to directly address GHG reductions, while others may result in GHG reductions as a co-benefit. In addition, in order to move forward with the goals of the waste management sector and achieve the 2030 target, certain actions are recommended to help set the groundwork. These actions affect several broad areas and are necessary for reducing the challenges facing this sector and are listed below as supporting actions.

Known Commitments

- Continue implementation of the Landfill Methane Control Measure.
- Continue implementation of the Mandatory Commercial Recycling Regulation and the Mandatory Commercial Organics Recycling requirements.
- As required by SB 1383 (Lara, Chapter 395, Statutes of 2016):
  - By 2018, ARB will adopt and implement the Short-Lived Climate Pollutant Strategy.
  - CalRecycle will develop regulations to require 50 percent organic waste diversion from landfills from 2014 levels by 2020 and 75 percent by 2025, including programs to achieve an edible food waste recovery goal of 20 percent below 2016 levels by 2025. The regulations shall take effect on or after January 1, 2022. By July 1, 2020, analyze the progress that the waste sector, State government, and local governments have made in achieving these goals.
  - CEC will develop recommendations for the development and use of renewable gas as part of the 2017 Integrated Energy Policy Report. Based on these recommendations, adopt policies and incentives to significantly increase sustainable production and use of renewable gas.

New Potential Measures or Supporting Action

Potential new measures are known to reduce GHGs, but may have technology, cost, or statutory barriers that may need to be addressed before they can be deployed in the near term.

- Establishing a sustainable State funding source (such as an increased landfill tip fee and new generator charge) for development of waste management infrastructure, programs, and incentives.
- Working with residents and producers to reduce the volume of waste generated overall and capitalize on technology and social changes that might enable waste reduction.
- Increasing organics diversion from landfills, building on established mandates (AB 341's 75 percent by 2020 solid waste diversion goal, AB 1594[75], AB 1826[76], AB 876[77]) and new short-lived climate pollutant targets for 2025 (SB 605, SB 1383) to be accomplished via prevention (including food rescue), recycling, composting/digestion, and biomass options.

[75] Assembly Bill 1594, *Waste Management*, (Williams, Chapter 719, Statutes of 2014).
[76] Assembly Bill 1826, *Solid Waste: Organic Waste*, (Chesbro, Chapter 727, Statutes of 2014).
[77] Assembly Bill 876, *Compostable Organics*, (McCarty, Chapter 593, Statutes of 2015).

- Addressing challenges and issues associated with significant expansion and construction of organics and recycling infrastructure in California that is needed in order to achieve recycling and diversion goals. Challenges and issues include permitting, grid/pipeline connection, funding, local siting, markets, and research.
- Developing programmatic Environmental Impact Reports (EIRs) and model permit and guidance documents to assist in environmental review and California Environmental Quality Act (CEQA) for new facilities.
- Providing incentives for expanded and new facilities to handle organics and recyclables to meet 2020 and 2030 goals.
- Providing incentives to develop and expand food rescue programs to reduce the amount of edible food being sent to landfills.
- Further quantifying co-benefits of compost products and addressing regulatory barriers that do not provide for consideration of co-benefits.
- Developing sustainable options for processing woody debris from urban areas, forests, and agriculture.
- Supporting the development of transportation fuel production at digestion facilities to generate renewable transportation fuels.
- Resolving issues of pipeline injection and grid connection to make renewable energy projects competitive.
- Supporting the use of available capacity at wastewater treatment plants that have digesters to process food waste.
- Working with local entities to provide a supportive framework to advance community-wide efforts that are consistent with, or exceed, statewide goals.
- Supporting research and development and pathways to market for dairy and co-digestion digesters, including pipeline injection and interconnection.
- Supporting research on digestate characterization and end products.

F. Water

Water is essential to all life, and is vital to our overall health and well-being. A reliable, clean, and abundant supply of water is also a critical component of California's economy and has particularly important connections to energy, food, and the environment. California's water system includes a complex infrastructure that has been developed to support the capture, use, conveyance, storage, conservation, and treatment of water and wastewater. This elaborate network of storage and delivery systems enables the State to prosper and support populations, amidst wide variability in annual precipitation rates and concentration of rain north of Sacramento, through storing and moving water when and where it is needed.

Local water agencies play an important role in delivering water to communities, farms and businesses. Some purchase water from the major State and federal projects, treat the water as needed and deliver it to their customers; others act as wholesale agencies that buy or import water and sell it to retail water suppliers. Some agencies operate their own local water supply systems, including reservoirs and canals that store and move water as needed. Many agencies rely on groundwater exclusively, and operate local wells and distribution systems. In recent decades, local agencies have developed

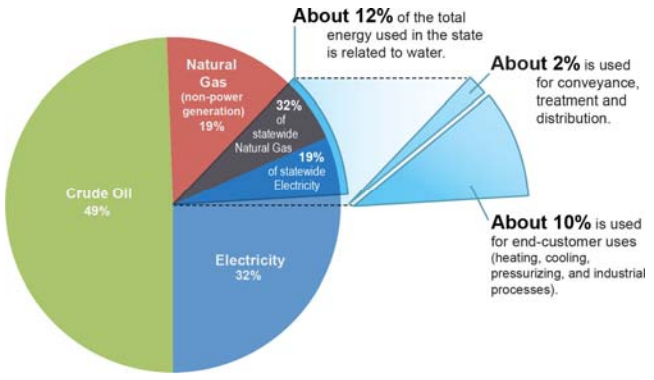
more diversified sources of water supplies. Many agencies use a combination of imported surface water and local groundwater, and also produce or purchase recycled water for end uses such as landscape irrigation.[78]

The State's developed surface and groundwater resources support a variety of residential, commercial, industrial, and agricultural activities. California's rapidly growing population -- estimated to reach 44 million by 2030[79] -- is putting mounting pressure on the water supply system. In the future, ability to meet most new demand for water will come from a combination of increased conservation and water use efficiency, improved coordination of management of surface and groundwater, recycled water, new technologies in drinking water treatment, groundwater remediation, and brackish and seawater desalination.[80]

One of the State's largest uses of energy is attributed to several aspects of the water life cycle, including treatment, heating, and conveyance of water. As shown in Figure II-4, overall, 10 percent of the State's energy use is associated with water-related end uses, while water and wastewater systems account for 2 percent of the State's energy use.[81] Therefore, as water demand grows, energy demand may increase concurrently. Population growth drives demand for both water and energy resources, so both grow at about the same rates and in many of the same geographic areas.[82] This dynamic is further exacerbated by the precipitation-population mismatch between Northern and Southern California.

The principal source of greenhouse gas (GHG) emissions from the water sector comes from the fossil fuel-based energy used to "produce" water (e.g., pump, convey, treat) and the fossil fuel-based energy consumed for water end uses (e.g., heating). Therefore, emission reduction strategies are primarily associated with reducing the energy intensity of the water sector. Energy intensity is a measure of the amount of energy required to take a unit of water from its origin (such as a river or aquifer) and extract and convey it to its end use.[83] Within California, the energy intensity of water varies greatly

Figure II-4. Energy Use Related to Water



[78] www.water.ca.gov/climatechange/RegionalEnergyIntensity.cfm
[79] www.dof.ca.gov/research/demographic/reports/projections/P-1/
[80] resources.ca.gov/docs/californiawateractionDraft Plan/2014CaliforniaWaterActionDraft Plan.pdf
[81] Department of Water Resources. Water-Energy Nexus: Statewide. Webpage accessed November 2016 at: www.water.ca.gov/climatechange/WaterEnergyStatewide.cfm
[82] Ibid.
[83] A broader definition of energy intensity could consider the "downstream" energy (i.e., wastewater treatment) as well as the upstream components. More robust data is needed and the State is working to better quantify these upstream and downstream emissions.

depending on the geography and water source. The California Department of Water Resources (DWR) subdivides the State into 10 regions corresponding to the State's major drainage basins. An interactive map on the DWR website allows users to see a summary of the energy intensity of regional water supplies.[84] As the energy sector is decarbonized through measures such as increased renewable energy and improved efficiency, energy intensities will also be reduced. It is also important to note that end user actions to reduce water consumption or replace fresh water with recycled water do not automatically translate into GHG reductions. The integrated nature of the water supply system means that a reduction by one end user can be offset by an increase in consumption by another user. Likewise, use of recycled water has the potential to reduce GHGs if it replaces, and not merely serves as an alternative to, an existing, higher carbon water supply.

The State is currently implementing several targeted, agricultural, urban, and industrial-based water conservation, recycling, and water use efficiency programs as part of an integrated water management effort that will help achieve GHG reductions through reduced energy demand within the water sector. A description of water sector programs in these targeted areas is included in Appendix G (to be released in early 2017).

While it is important for every sector to contribute to the State's climate goals, ensuring universal access to clean water as outlined in AB 685 (Eng, Chapter 524, Statutes of 2012), also known as the "human right to water" bill, should take precedence over achieving GHG emission reductions from water sector activities where a potential conflict exists. AB 685 states that it is the policy of the State that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes." As described in this section, water supplies vary in energy intensity and resulting GHGs due to the source of the water, treatment requirements, and location of the end user.

1. Looking to the Future

This section outlines the high-level objectives and goals to reduce GHGs in this sector.

Goals

- Support more reliable water supplies and a more resilient, sustainably managed water resources system with a focus on actions that provide direct GHG reductions
- Make conservation a California way of life and use and reuse water more efficiently with greater water conservation, recycling, and reuse to help meet future water demands and adapt to climate change
- Support programs and projects that increase water sector energy efficiency and reduce GHG emissions through reduced water and energy use
- Reduce the carbon footprint of water systems and water uses for both surface and groundwater supplies through integrated strategies that reduce GHG

[84] www.water.ca.gov/climatechange/RegionalEnergyIntensity.cfm

emissions of water while meeting the needs of a growing population, improving public safety, fostering environmental stewardship, and supporting a stable economy

2. Cross-Sector Interactions

Water, energy, food, and ecosystems are inextricably linked and meeting future climate challenges will require an integrated approach to managing the resources in these sectors.

Water is used in various applications in the energy sector, ranging in intensity from cooling of turbines and other equipment at power plants to cleaning solar photovoltaic panels. In 2003, CEC adopted a water conservation policy for power plants to limit the use of freshwater for power plant cooling, and has since encouraged project owners proposed to build new power plants in California to reduce water consumption with water-efficiency technologies such as dry cooling and conserve freshwater by using recycled water. Likewise, energy is used in multiple ways and at multiple steps in water delivery and treatment systems, including energy for treating and delivering drinking water; heating and chilling water; conveying water; extracting groundwater; desalination; pressurizing water for irrigation; and wastewater collection, treatment, and disposal.

Although GHG reduction strategies for the water sector have the closest ties to energy, the water sector also interacts with the natural and working lands, agricultural, waste management, and transportation sectors. Water flows from mountains to downstream regions through natural and working lands, which provide habitat for many species and functions to store water, recharge groundwater, naturally purify water, and moderate flooding. Protection of key lands from conversion results in healthier watersheds by reducing polluted runoff and maintaining a properly functioning ecosystem. California is the United States' leading agricultural production state in terms of value and crop diversity. Approximately nine million acres of farmland in California are irrigated.[85] In addition, water use is associated with livestock watering, feedlots, dairy operations, and other on-farm needs. Altogether, agriculture uses about 40 percent of the State's managed water supply.[86] In the end, agricultural products produced in California are consumed by humans throughout the world as food, fiber, and fuel. Wastewater treatment plants provide a complementary opportunity for the waste management sector to help process organic waste diversion from landfills. Treatment plants with spare capacity can potentially accommodate organic waste for anaerobic co-digestion of materials such as food waste and fats, oil, and grease from residential, commercial, or industrial facilities to create useful byproducts such as electricity, biofuels, and soil amendments. The water sector is also essential to our community health and long-term well-being, and measures must ensure that we continue to have access to clean and reliable sources of drinking water. Climate change threatens to impact our water supplies, for example, with long-term droughts leading to wells and other sources of

[85] www.arb.ca.gov/fuels/lcfs/workgroups/lcfssustain/hanson.pdf
[86] Applied water use is the official terminology used by DWR. "Applied water refers to the total amount of water that is diverted from any source to meet the demands of water users without adjusting for water that is used up, returned to the developed supply, or considered irrecoverable."

water running dry. This can have devastating consequences, especially on communities already vulnerable and sensitive to changes in their water supply and natural hydrological systems, including rural communities who have limited options for water supplies. Water conservation and management strategies that are energy efficient can also ensure a continued supply of water for our health and well-being.

3. Known Commitments and Potential New Measures to Reduce Greenhouse Gases

The measures below include some required and new potential measures to help achieve the State's 2030 target and to support the high-level objectives for this sector. Some measures may be designed to directly address GHG reductions, while others may result in GHG reductions as a co-benefit. In addition, several recommended actions are identified to help the water sector move forward with the identified goals and measures to achieve the 2030 target; these are listed as supporting actions.

Known Commitments

- As directed by Governor Brown's Executive Order B-37-16, DWR and State Water Resources Control Board (SWRCB) will develop and implement new water use targets to generate more statewide water conservation than existing targets (the existing State law requires a 20 percent reduction in urban water use by 2020 (SBx7-7, Steinberg, Chapter 4, Statutes of 2009)). The new water use targets will be based on strengthened standards for indoor use, outdoor irrigation, commercial, industrial, and institutional water use.
- SWRCB will develop long-term water conservation regulation, and permanently prohibit practices that waste potable water.
- DWR and SWRCB will develop and implement actions to minimize water system leaks, and to set performance standards for water loss, as required by SB 555 (Wolk, Chapter 679, Statutes of 2015).
- DWR and CDFA will update existing requirements for agricultural water management plans to increase water system efficiency.
- CEC will certify innovative technologies for water conservation, and water loss detection and control.
- CEC will continue to update the State's Appliance Efficiency Regulations (California Code of Regulations, Title 20, Sections 1601-1608) for appliances offered for sale in California to establish standards that reduce energy consumption for devices that use electricity, gas, and/or water.
- Cal/EPA will oversee development of a registry for GHG emissions resulting from water-energy nexus, as required by SB 1425.

Overall, these actions will contribute to the broader energy efficiency goals discussed in the Low Carbon Energy section of this chapter.

New Potential Measures or Supporting Actions
Potential new measures are known to reduce GHGs, but may have technology, cost, or statutory barriers that may need to be addressed before they can be deployed in the near term.

- Local water and wastewater utilities should adopt a long-term goal to reduce GHGs by 80 percent below 1990 levels by 2050 (consistent with DWR's Climate Action Plan), and thereafter move toward low carbon or net-zero carbon water management systems where technically feasible and cost-effective.
- In support of the Short-Lived Climate Pollutant Strategy, encourage resource recovering wastewater treatment projects to help achieve the goal of reducing fugitive methane by 40 percent by 2030, to include:
    - Determining opportunities to support co-digestion of food-related waste streams at wastewater treatment plants.
    - Incentivizing methane capture systems at wastewater treatment plants to produce renewable electricity, transportation fuel, or pipeline biomethane.
- Support compact development and land use patterns, and associated conservation and management strategies for natural and working lands that reduce per capita water consumption through more water-efficient built environments.

III. The Strategy to 2030

Please note all modeling results in this draft are preliminary and subject to change for the January Proposed Scoping Plan pending refinements to input assumptions and modeled actions. The changes are expected to result in similar results when scenarios are compared to each other, with the exception that Alternative 1 will achieve the 2030 target.

Before we can identify the policies and measures to achieve the 2030 target, it is important to understand the sources of emissions. Figure l-3 in Chapter I provides the percent contribution to statewide emissions from the main economic sectors as reflected in the 2014 Greenhouse Gas (GHG) Emission Inventory (2016 Edition).[87] Climate change mitigation policies must be considered in the context of the sector's contribution to the State's total GHGs. The transportation, electricity (in-State and imported), and industrial sectors are the largest sectors for GHGs in the inventory and present the largest opportunities for GHG reductions. However, to ensure decarbonization across the entire economy to achieve long-term climate goals, policies must be considered for other sectors in both built and natural environments. Furthermore, over time, other sectors may contribute a larger portion to the State's GHGs. Policies that support clean technology, energy efficiency, and renewable energy can also provide co-benefits for criteria and air toxic pollutants, especially in the largest emissions sectors such as the transportation sector.

Many of the strategies to achieve the 2030 target are already required mandates in statute, being implemented for achieving federal or State air quality standards, or being pursued to reduce dependence on fossil energy. Some of these policies and measures directly target GHG emissions reductions or achieve GHG emissions reductions as co-benefits. For example, the increased Renewables Portfolio Standard (RPS) and energy efficiency requirements reduce dependence on fossil energy and drive energy diversification, while various transportation plans will go far in reducing GHGs while primarily helping the State achieve federal air quality standards for criteria pollutants. This 2030 Target Scoping Plan identifies the new policies or measures and potential enhancements may be needed to ensure the State achieves the remaining amount of GHG reductions in a complementary, flexible, and cost effective manner. While there are direct policies and measures to address criteria and toxic air pollutants, this 2030 Target Scoping Plan maximizes these co-benefits to the extent feasible. These policies should continue to encourage reductions beyond 2030 to keep us on track to stabilize climate. Policies that ensure economy-wide investment decisions incorporate consideration of GHG emissions are particularly important.

At the same time, we must acknowledge the integrated nature of our built and natural environments and polices. Each of the policies directed at the built environment must be considered against the high-level land use goals. Policies that support these sectors must support the long-term need to sequester carbon, in addition to also providing ecosystem benefits such as better water quality, increased water yield, soil health,

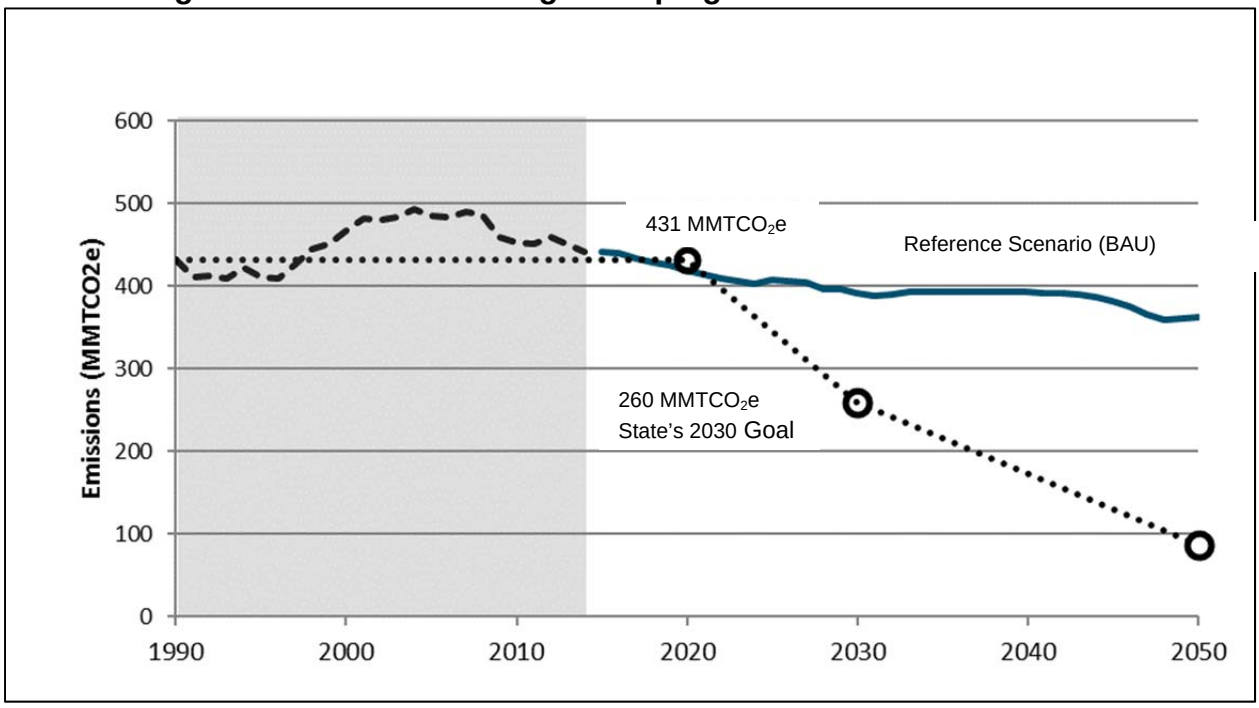
[87] Based on 100-year global warming potentials (GWP) and the IPCC Fourth Assessment Report (FAR).

reduced erosion, and habitat connectivity. These policies and co-benefits are considered as part of the integrated strategy outlined above.

In charting the path towards the 2030 statewide GHG target, we also need to understand the GHG reductions needed between now and 2030 to reach our target. This is best understood by first modeling a Reference Scenario (also referred to as "Business as Usual", or BAU), which extends today's existing actions to 2030 to depict future GHG emissions levels. The Reference Scenario is the forecasted level of statewide total GHG emissions in 2030 without any further action to reduce GHGs.

Figure lll-1 provides the modeling results for a Reference Scenario for the Discussion Draft. The graph shows the State is expected to reduce emissions below the 2020 statewide GHG target, but additional effort will be needed to maintain and continue GHG reductions to meet the mid (2030) and long-term (2050) targets. More details about the modeling for the Reference Scenario can be found in Appendix I (to be released in early 2017).

Figure lll-1. Draft 2030 Target Scoping Plan Reference Scenario



A. Known Commitments

With the passage of Senate Bill 350 (SB 350, De Leon, Chapter 547, Statutes of 2015), California put itself on a path to decarbonize the electricity sector through Integrated Resource Planning (IRP), an increased RPS and a goal to double energy efficiency in electricity and natural gas end uses. This statutory mandate is one element of the known commitments that California is already planning to pursue in the near and long-term. The list of known commitments represents some actions that are required by

statute, included in adopted plans, or those in the process of being developed, and reasonably expected future action. The list below provides a summary of the known commitments that will be part of any strategy to achieve the 2030 target:

- SB 350 – by 2030[88]
  - Primary goals: Reduce GHG emissions in the energy sector through GHG emission reduction planning targets and IRPs.
    - Load serving entities have the flexibility to meet GHG emission reduction planning targets through a combination of measures as described in IRPs.
    - 50 percent RPS.
    - Doubling of energy efficiency savings in natural gas and electricity end uses statewide.
- Increase in Low Carbon Fuel Standard (LCFS) – by 2030
  - Primary goal: Reduce dependence on fossil fuels.
    - Carbon Intensity (CI) reduction: At least 18 percent reduction in CI, which is the amount that was modeled in the ARB Mobile Source Strategy to achieve federal air quality standards.
- Mobile Source Strategy (Cleaner Technology and Fuels)[89]
  - Primary goal: Help the State achieve its federal air quality standards and climate goals.
    - 1.5 million zero emission and plug-in hybrid light-duty electric vehicles by 2025.
    - Medium and Heavy-Duty GHG Phase 2.
    - Advanced Clean Transit: 20 percent of new urban buses purchased beginning in 2018 will be zero emission buses, ramping up to 100 percent of new sales in 2030. Also, new natural gas buses, starting in 2018, and diesel buses, starting in 2020, meet the optional heavy-duty low-NOx standard.
    - Last Mile Delivery: Requirement to purchase low-NOx engines if available, and phase-in of zero emission trucks for class 3-7 last mile delivery trucks starting in 2020. Zero emission vehicles (ZEVs) comprise 2.5 percent of new Class 3-7 truck sales in local fleets starting 2020, increasing to 10 percent in 2025 and remaining flat through 2030.
    - Reduction to vehicle miles travelled (VMT), to be achieved in part by continued implementation of SB 375 and regional Sustainable Community Strategies; forthcoming statewide implementation of SB 743; and additional VMT reduction strategies not specified in the Mobile Source Strategy, but included in the document "Potential VMT Reduction Strategies for Discussion" in Appendix G (to be released early 2017).[90]

[88] leginfo.legislature.ca.gov/faces/billNavClient.xhtml?billid=201520160SB350
[89] www.arb.ca.gov/Draft Planning/sip/2016sip/2016mobsrc.htm
[90] www.arb.ca.gov/cc/scopingplan/meetings/091316/Potential%20VMT%20Measures%20For%20Discussion_9.13.16.pdf

- Implementation of currently proposed Short-Lived Climate Pollutant (SLCP) Strategy – by 2030[91]
    - Primary goal: Reduce highly potent SLCP gases.
        - 40 percent reduction in methane and hydrofluorocarbon (HFC) emissions.
        - 50 percent reduction in black carbon emissions.
- Increased stringency of SB 375 Sustainable Communities Strategy – 2035 targets[92]
    - Primary goal: Reduce GHG emissions.
- California Sustainable Freight Action Plan[93]
    - Primary goal: Improve freight efficiency, transition to zero emission technologies, and increase competitiveness of California's freight system.
        - Improve freight system efficiency by 25 percent by 2030.
        - Deploy over 100,000 freight vehicles and equipment capable of zero emission operation and maximize near-zero emission freight vehicles and equipment powered by renewable energy by 2030.

Table lll-1 summarizes the results of the modeling for the Reference Scenario, known commitments, and the cumulative gap that still needs to be addressed to achieve the 2030 target. The table also lists the GHG emission levels for the year 2030 for the Reference Scenario and with the known commitments.

Per SB 32, the 2030 limit is 260 million metric tons of CO2 equivalents ($MMTCO_2e$). That is a limit in a specific year. The 671 $MMTCO_2e$ cumulative number is the estimated total reductions needed between 2021 and 2030 to achieve the 2030 limit. There is no statutory cumulative limit, even though our analyses present some results in cumulative form.

There are several reasons to evaluate the draft 2030 Target Scoping Plan policies and measures using the cumulative construct. Importantly, policies and measures may perform differently over time. For example, in early years, a policy or measure may be slow to be deployed, but over time has greater impact. If you were to look at its performance in 2021 versus 2030, you would see that it may not seem important and deliver significant reductions in the early years, but is critical for later years as it results in greater reductions in any year over time. Using a cumulative construct allows for a flexibility in evaluating the effectiveness of any measure over time instead of a snap shot for a single year.

[91] www.arb.ca.gov/cc/shortlived/shortlived.htm
[92] www.arb.ca.gov/cc/sb375/sb375.htm
[93] www.casustainablefreight.org/

Table lll-1. Draft 2030 Modeling GHG Results for the Reference Scenario and Known Commitments

Modeling Scenario	2030 GHG Level $MMTCO_2e$	Cumulative GHG reductions 2021 – 2030	Cumulative Gap to 2030 Target
Reference Scenario (Business-as-Usual)	391	n/a	671
Known Commitments	306	533	138

The following sections provide the draft 2030 Target Scoping Plan Scenario and alternatives for achieving the 2030 statewide target. After a brief description of each strategy, there is a table for comparison of key criteria across each of the strategies.

B. Scenario Development and Modeling

The draft 2030 Target Scoping Plan Scenario and alternatives were constructed based on the options provided in the 2030 Target Scoping Plan Update Concept Paper and comments received on the four options. The four options were collapsed into three options to reflect comments from stakeholders and to construct paths that reflect the direction in AB 32, SB 32, and AB 197. All three scenarios include the known commitments—discussed above. In order to close the gap and meet the 2030 GHG target, the draft 2030 Target Scoping Plan Scenario relies on direct GHG reductions at refineries and a Cap-and-Trade Program with declining caps. *Alternative 1 – No Cap-and-Trade* relies on greater GHG reductions at refineries, increased action under the known commitments, and additional policies for the transportation, industrial, and energy sectors. *Alternative 2 – Carbon Tax* relies on GHG reductions at refineries and a carbon tax. Some of the policies and measures included in the scenarios may have technical, cost, or authority barriers that would need to be addressed before they can be implemented. The scenarios are illustrative combinations of policies and measures that could be pursued in achieving the 2030 target. The actual set of policies and measures chosen for implementation may be slightly different as more analyses are undertaken for each one to inform its design and implementation mechanisms.

Table lll-2 provides a summary of the modeled policies and measures for the draft 2030 Target Scoping Plan Scenario and alternatives within the built environment. Some policies for the electricity sector, such as the 60 percent RPS, are meant to be a proxy for enhanced actions that would result through the IRP process and not necessarily through a change to existing statute. The natural environment is modeled separately as provided in Chapter ll as PATHWAYS does not include the natural working lands sector.

Table III-2. Summary of Modeled Policies and Measures in each Scenario*

	Draft 2030 Target Scoping Plan Scenario	Alternative 1 No Cap-and-Trade	Alternative 2 Carbon Tax
Known Commitments	X	X	X
Increased Renewables RPS – 60%		X	
Increased LCFS LCFS – 25%		X	
Increased Mobile Source Strategy for ZEVs Additional ZEVs – 500-600K		X	
Cap-and-Trade	X		
Carbon Tax			X
Direct refinery reductions – 20%	X		X
Direct refinery reductions – 30%		X	
Direct industrial reductions – 25%		X	
Increased utilization of renewable natural gas (5% increase for residential, commercial, and industrial end uses)		X	
Heat pump electrification		X	
Accelerated retirement & replacement of furnaces		X	
Accelerated retirement & replacement of gasoline vehicles		X	

*Each scenario also includes the policies and measures that will be identified to support reduced GHG emissions and carbon sequestration enhancements for the natural and working lands sector as modeled in Chapter II. This table only includes the policies and measures identified for modeling in PATHWAYS.

There are a variety of models that can be used to model GHG emissions. For this plan, the State is using the PATHWAYS model.[94] PATHWAYS is structured to model GHG emissions while recognizing the integrated nature of the industrial economic and energy sectors. For example, if the transportation sector adds more electric vehicles, PATHWAYS responds to reflect an energy demand increase in the electricity sector. However, PATHWAYS does not reflect any change in transportation infrastructure demand associated with additional ZEVs on the road. The ability to capture a subset of interactive effects of policies and measures helps to provide a representation of the interconnected nature of the system and impacts to GHGs.

At this time, PATHWAYS does not include a module for natural and working lands. As such, it is not possible to model the interactive effects of polices aimed at the economic and energy sectors and their effect on land use, nor is it possible to model the interactive effects of polices aimed at the natural environment and their impact on the economic and energy sectors. For this plan, external inputs had to be developed for

[94] www.arb.ca.gov/cc/scopingplan/meetings/meetings.htm

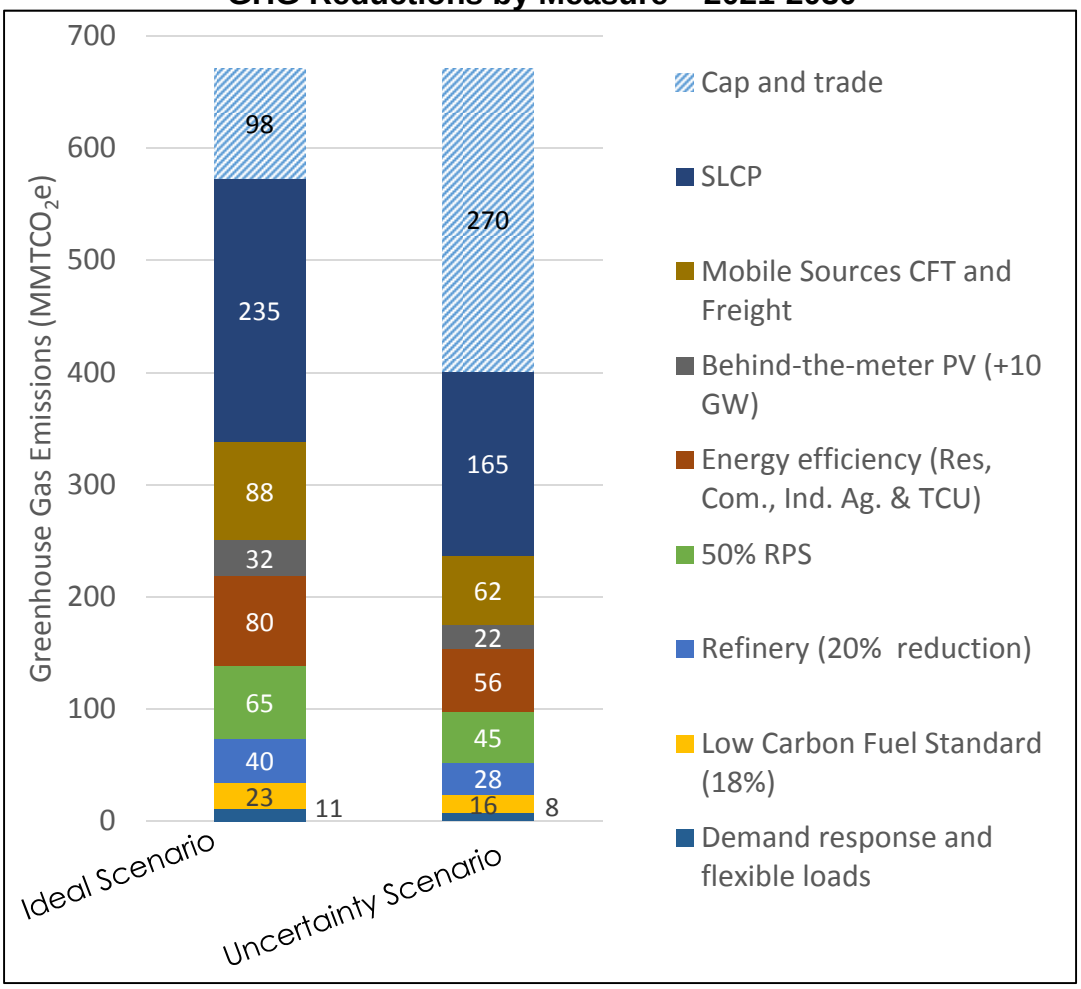
PATHWAYS to supply biofuel volumes. The natural and working lands sector is also being modeled separately as described in Chapter ll Section D. ARB and other State agencies will work to integrate all the sectors into one model to fully capture interactive effects across both the natural and built environments before the next Scoping Plan update.

C. Draft 2030 Target Scoping Plan Scenario

In order to achieve the 2030 target, this strategy includes the known commitments described above and then relies on the additional measures of a post-2020 Cap-and-Trade Program with declining caps and a 20 percent reduction by 2030 in GHG emissions at refineries from current levels.

For the draft 2030 Target Scoping Plan Scenario, the post-2020 Cap-and-Trade Program and refinery measure would need to deliver 138 $MMTCO_2e$ cumulative GHG emissions reductions from 2021 through 2030. Reductions at the refineries are expected to account for about 40 $MMTCO_2e$ cumulatively from 2021 to 2030. Onsite action to improve combustion efficiency or process lighter crude would provide air quality co-benefits. If the estimated GHG reductions from the known commitments and refineries aren't realized due to delays in implementation or technology deployment, the post-2020 Cap-and-Trade Program would deliver the additional GHG reductions to ensure the 2030 target is achieved. Figure lll-2 provides an illustration of the cumulative emission reduction contributions of the known commitments, refinery measure, and Cap-and-Trade Program from 2021 to 2030.

Figure lll-2. Draft 2030 Target Scoping Plan Scenario – Estimated Cumulative GHG Reductions by Measure – 2021-2030



The Ideal Scenario represents a best case where current and proposed GHG reduction policies and measures begin today, perform as expected, and technology is readily available and deployed on schedule. The Uncertainty Scenario represents uncertainty surrounding measure performance. This uncertainty was modeled by delaying the start of the policies and measures until 2021 and represents implementation, technology, and other uncertainties. These two bars represent a range of expected cumulative reductions for each measure. An important feature of the Cap-and-Trade Program is that it can scale to play a larger or smaller role in the overall strategy to induce GHG reductions in the covered sectors depending on how the other measures perform. In the Ideal Scenario, the Cap-and-Trade Program would need to deliver approximately 98 $MMTCO_2e$ net savings of the 671 $MMTCO_2e$, which would account for about 15 percent of the total reductions between 2021 and 2030.

Another way to look at this scenario is to understand the trajectory of GHG reductions over time, relative to the 2030 target. Figure lll-3 provides the trajectory of GHG emissions modeled for the draft 2030 Target Scoping Plan Scenario, excluding GHG reductions from the Cap-and-Trade Program.

Figure lll-3. Draft 2030 Target Scoping Plan Scenario – Ideal Scenario GHG Reductions

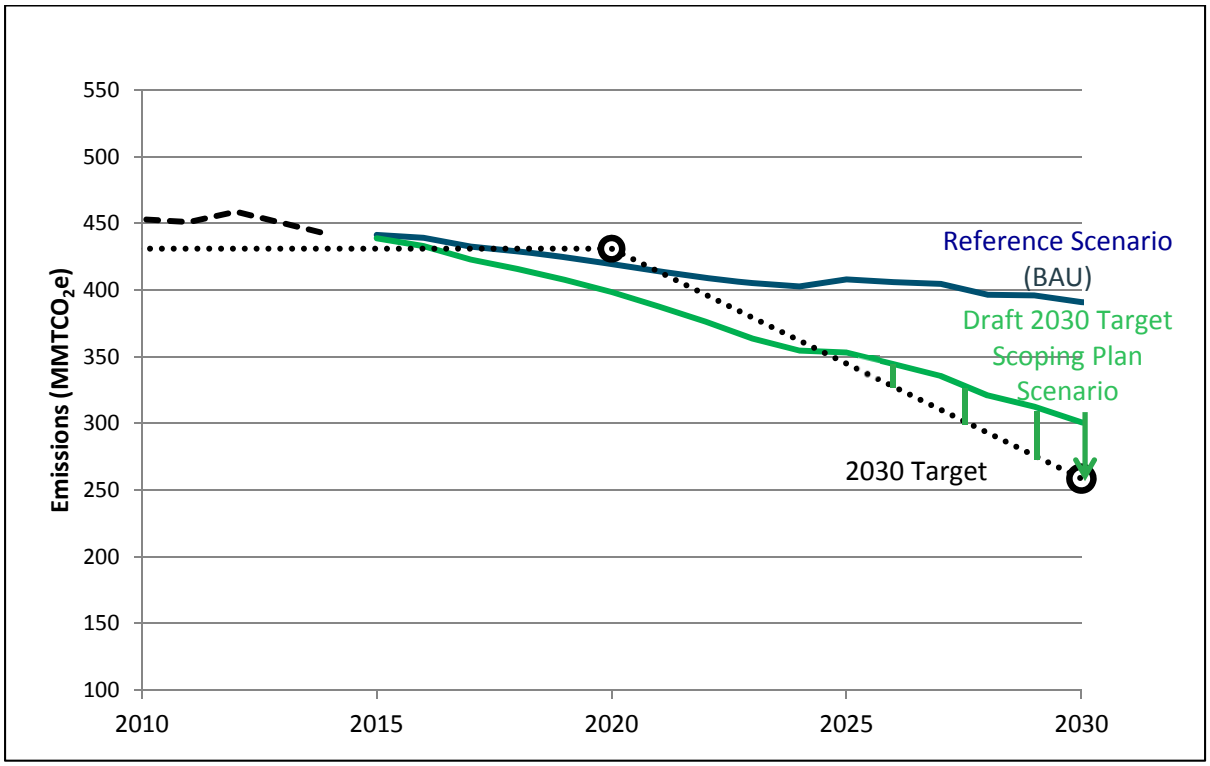


Figure lll-3 includes both the Reference Scenario (blue) and the draft 2030 Target Scoping Plan Scenario, excluding the impact of the Cap-and-Trade Program (green). Between the periods of 2020 and about 2025, the measures in the draft 2030 Target Scoping Plan Scenario constrain GHG emissions below the dotted straight line. After 2025, GHG emissions continue to fall, but at a slower rate than needed to meet the 2030 target. It is the Cap-and-Trade Program that will constrain the emissions (equal to the shaded area) to the necessary levels to achieve the 2030 target. In this scenario, it is estimated that the known commitments and the refinery measure will result in an emissions level of about 301 $MMTCO_2e$ in 2030. The Cap-and-Trade Program would need to deliver about 40 $MMTCO_2e$ in 2030 to ensure the 2030 target is achieved.

20 Percent Reduction in GHGs at Refineries

The proposed new regulation to achieve a 20 percent GHG reduction in the refinery sector would require all refineries, by 2030, to achieve the efficiency of the most efficient existing refinery on a simple barrel basis. An efficiency benchmark is reflected as GHG emissions per unit of product. This regulation would not limit mass GHG emissions, but would require facilities to become more efficient through any combination of actions such as fuel switching, boiler electrification, onsite investments in newer more energy efficient technologies, use of lighter crude slates, and any other process efficiencies that would be identified in consultation with local air districts and ARB.

The stringency of this measure was determined by reviewing the benchmarking data provided by the refineries when the Cap-and-Trade Regulation was being developed. From that data, staff was able to identify the most efficient refinery in the State. Staff then assumed that all refineries had the same efficiency and calculated the resulting emissions using the individual refinery production data for 2014. A comparison of the actual reported emissions for 2014 and the calculated emissions by assuming all refineries were as efficient as the most efficient refinery allowed staff to compare the difference between the two values and estimate the GHG difference. While not all refineries are designed the same way and all would be starting from different efficiency levels, this measure assumes some refineries may be able to do more than others to reduce their GHG emissions. Therefore, the actual measure will need to accommodate unique circumstances at individual facilities in this sector.

Regulations would need time to be developed and implemented for the refinery sector. There would most likely need to be several different regulatory paths based on facility size. The exact level of reductions may be different pending a rulemaking effort that gathers more detail about specific opportunities for reductions that would also need to take into account potential increased production activity, especially for biofuels.

One initial implementation step for this new industrial sector strategy would be for the State to partner with California's local air pollution control and air quality management districts (air districts), which traditionally permit these facilities for criteria pollutants and toxic air contaminants. Together, the State and local air districts could identify efficiency improvement opportunities for stationary source combustion equipment. This strategy would be prioritized for all refinery facilities subject to the Energy Efficiency Audit[95] in the areas where Best Available Retrofit Control Technology (BARCT) requirements are applicable.[96] BARCT measures would be implemented through the existing air district BARCT/All Feasible Measures process. The BARCT determinations also promote consistency of controls for similar emission sources among districts with the same air quality attainment designations. BARCT/All Feasible Measures would be required to demonstrate reductions of criteria pollutants and GHGs. Examples of possible BARCT/All Feasible Measures combustion controls include:

- Energy efficiency standards for larger combustion equipment.
- Mandatory equipment replacement requirements.
- Installation of new and emerging technologies.
- Heat rate improvement projects.
- Installation of electronic controls.
- Installation of waste heat recovery systems.
- Optimization study and implementation.

This refinery measure is a prioritization of direct GHG reductions at large stationary sources pursuant to AB 197, and in addition to reducing GHG emissions is also

[95] www.arb.ca.gov/cc/energyaudits/energyaudits.htm
[96] Bay Area, El Dorado (partial), Monterey Bay, Placer (partial), Sacramento, San Diego, San Joaquin Valley, South Coast, Ventura, and Yolo-Solano.

expected to provide co-benefits of reducing criteria pollutants and toxic air contaminants in some of the most polluted and disadvantaged communities in the State.

Post-2020 Cap-and-Trade Program with Declining Caps

By extending the existing Cap-and-Trade Program post-2020, the State preserves its current linkages and supports future linkages. The high compliance rates with the Cap-and-Trade Program also demonstrate the infrastructure and implementation features of the program are well designed and understood by the regulated community. This strategy also lends itself to easy integration with the Clean Power Plan requirements and is flexible to allow expansion to other sectors or regions.

With this approach, funds would also continue to be deposited into the Greenhouse Gas Reduction Fund (GGRF) to support projects that fulfill the goals of AB 32. Investment of these proceeds furthers the goals of AB 32 by reducing GHG emissions, providing net GHG sequestration, providing co-benefits, investing in disadvantaged communities and low-income communities, and supporting the long-term, transformative efforts needed to improve public and environmental health and develop a clean energy economy. These investments support programs and projects that deliver major economic, environmental, and public health benefits for Californians, including meaningful benefits to the most disadvantaged communities. Investments are providing a multitude of benefits to disadvantaged communities including increased affordable housing opportunities, reduced transit and transportation costs, access to cleaner vehicles, improved mobility options and air quality, job creation, energy and water savings, and greener and more vibrant communities.

Further, the Environmental Justice Advisory Committee (EJAC) recommends and AB 197 mandates greater prioritization of GHG emission reductions at large stationary sources. While GHG reductions will occur in the covered entities under the current design of the program, ARB has begun the process to evaluate potential changes to program design features that would support greater GHG emissions reductions at Cap-and-Trade Program covered entities, which could potentially also yield air quality co-benefits. These potential program design changes would need to be further evaluated for economic impacts, coordinated with linked partners, and be part of a rulemaking that would take effect beginning in 2021. The areas to be evaluated include, but are not limited to:

- Evaluating further limiting of offsets.
- Redesigning the allocation strategy to reduce free allocation at a rate to support increased technology and energy investment at covered entities to reduce GHG emissions.
- Reducing allocation if the covered entity increases criteria or toxics emissions over some baseline.

D. Alternative 1 – No Cap-and-Trade

Alternative 1 includes the known commitments described in Section A plus the 30 percent reduction in GHG emissions in the refinery sector, but does not include a post-2020 Cap-and-Trade Program. In order to ensure the State achieves its climate goals, this alternative would need to rely on some additional actions beyond the known commitments. The characterization of the additional actions is not meant to imply changes to existing statutory requirements. For example, SB 350 calls for an RPS of at least 50 percent by 2030. The modeled RPS of 60 percent by 2030 in this scenario indicates the need for more incremental renewables beyond the 50 percent RPS; this could be an outcome of the IRP process where the individual load serving entities would be planning for more reductions towards helping the sector achieve the 2030 target in the absence of a Cap-and-Trade Program.

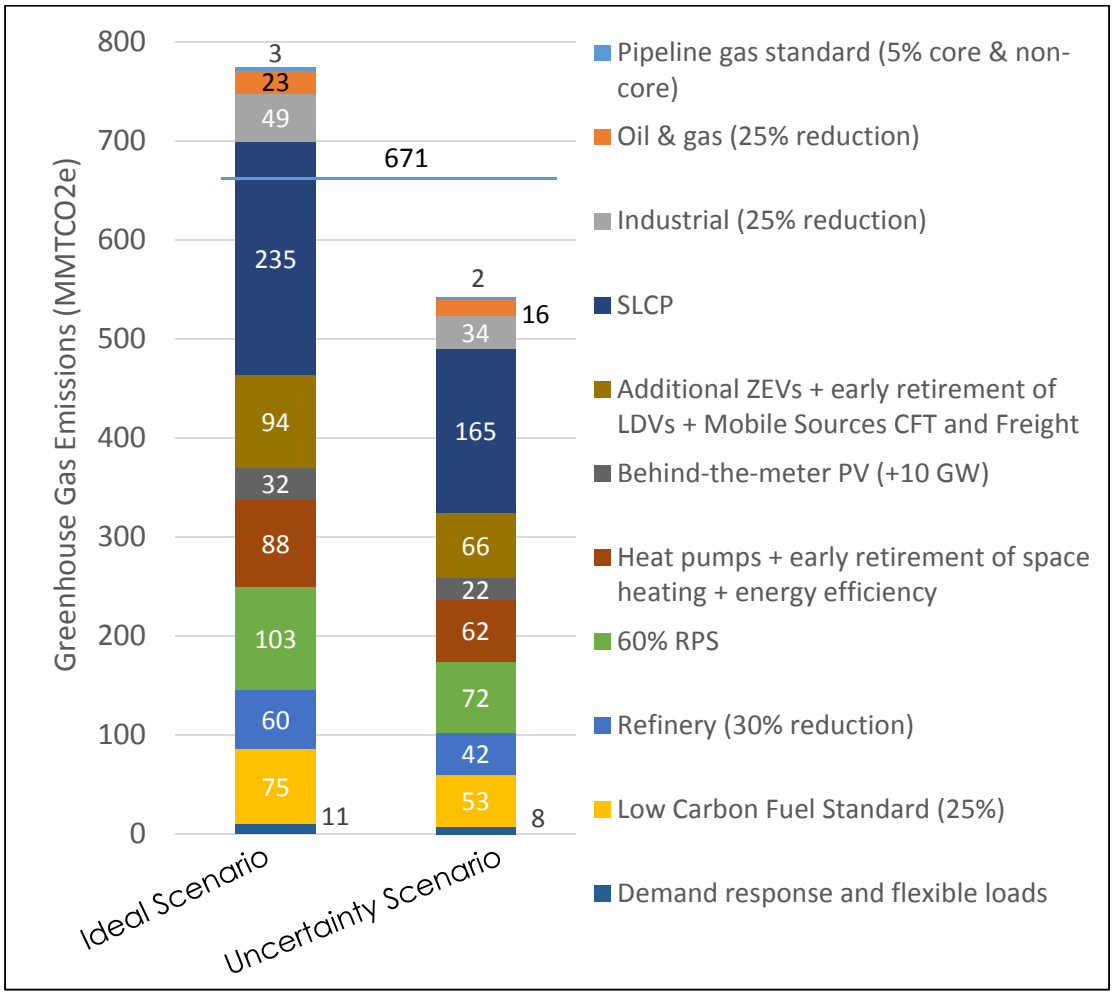
Importantly, some of the specific polices and measures modeled for this scenario may have technology, cost, or legal authority barriers that may prevent implementation from occurring. The enhancements to the known commitments below and new policies and measures are illustrative of the additional type of action that is needed in this scenario in the absence of a Cap-and-Trade Program and are not necessarily the exact suite of policies or measures that would be selected in the absence of a Cap-and-Trade Program.

- As part of IRPs: More renewables than a 50 percent RPS – by 2030
    - 60 percent RPS
- More ambitious LCFS – by 2030
    - Carbon Intensity reduction: At least 25 percent reduction in CI
- Low Emission Diesel Standard
- Mobile Source Strategy – More Ambitious Light-Duty Vehicle ZEV Deployment
    - Increase the light-duty ZEVs by an additional 500,000—600,000 focusing on deployment in the South Coast
- 30 percent reduction in GHGs at refineries by 2030
- 25 percent reduction in GHG emissions at industrial and oil and gas extraction facilities by 2030
- 5 percent increase in utilization of renewable natural gas for core and non-core customers by 2030
    - Renewable natural gas to be procured and delivered to core and non-core customers (residential, commercial, small industrial). Renewable natural gas can be a combination of renewable hydrogen or biogas. Credit could also be earned through electrification of natural gas loads. Total renewable natural gas reaches 5 percent of energy delivered to core and non-core customers by 2030.
- Electric Heat Pumps in buildings (heating, ventilation, and air conditioning (HVAC) and water heating) – by 2030
- Accelerated retirement of existing residential and commercial gas furnaces, replaced with heat pumps

- Accelerated retirement of older light-duty gasoline vehicles, replaced with more efficient gasoline vehicles

Figure lll-4 provides an illustration of the relative cumulative (2021 to 2030) GHG reductions from the measures in *Alternative 1 – No Cap-and-Trade.*

Figure lll-4. Alternative 1 – No Cap-and-Trade – Estimated Cumulative GHG Reductions from Main Measures*



*"Pipeline gas standard" refers to 5 percent increased utilization of renewable natural gas.

Again, the Ideal Scenario represents a best case where current and proposed GHG reduction policies and measures begin today, perform as expected, and technology is readily available and deployed on schedule. The Uncertainty Scenario represents uncertainty surrounding measure performance. This uncertainty was modeled by delaying the start of the policies and measures until 2021 and represents implementation, technology, and other uncertainties. While under the Ideal Scenario, Alternative 1 could achieve greater cumulative reductions than 671 MMTCO2e, if Alternative 1 underperforms, it is short of the total reductions needed to achieve the 2030 target and new measures would need to be deployed to ensure the 2030 target is achieved. Unlike the Cap-and-Trade Program in the draft 2030 Target Scoping Plan

Scenario, none of the measures in this scenario scale to deliver any additional reductions if other measures underperform.

Again, another way to look at this scenario is to understand the trajectory of GHG reductions over time, relative to the 2030 target. Figure lll-5 provides the trajectory of GHG emissions modeled for Alternative 1.

Figure lll-5. Alternative 1 – Ideal Scenario GHG Reductions

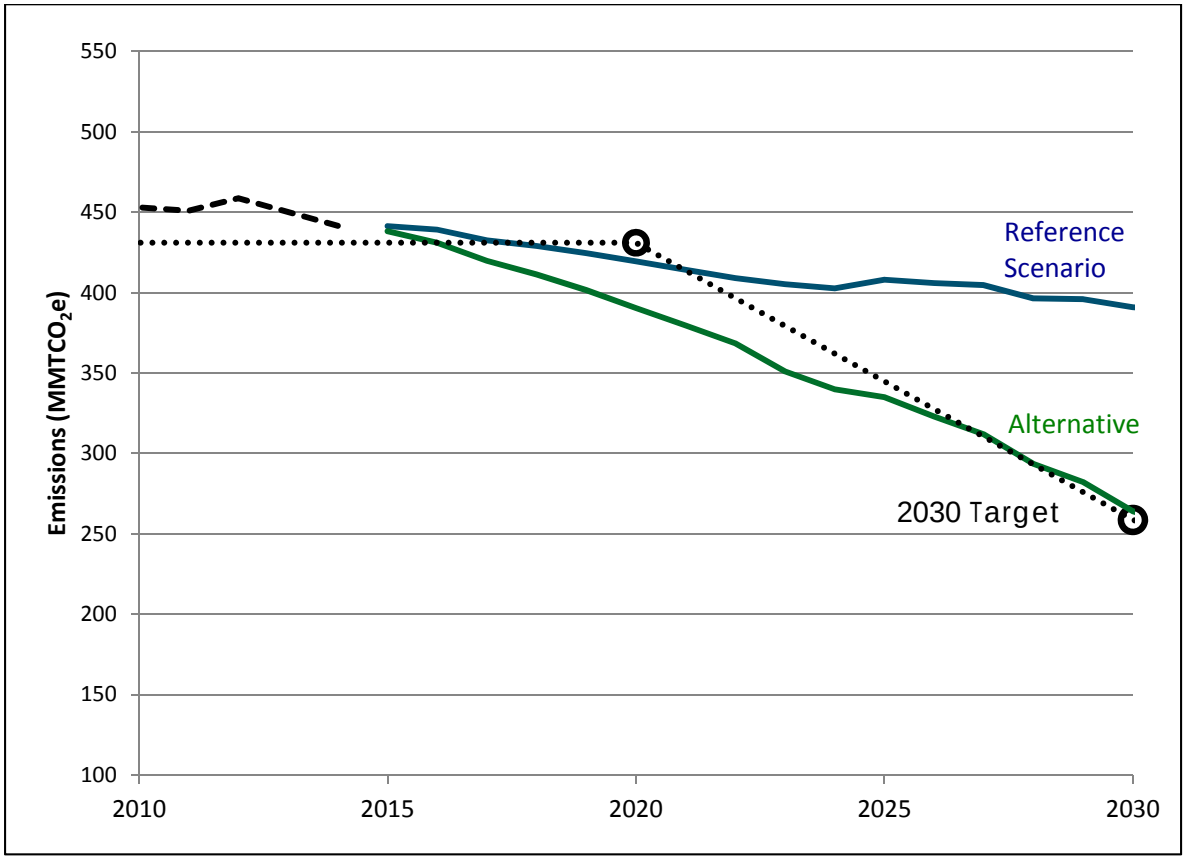


Figure lll-5 includes both the Reference Scenario (blue) and the Alternative 1 (green). Between the periods of 2020 and about 2026, the measures in Alternative 1 constrain the emissions below the dotted straight line between the 2020 and 2030 targets. After 2026, GHG emissions continue to fall, but at a rate that is slightly less than needed to achieve the 2030 GHG target. There is no policy or measure in Alternative 1 to ensure that the 2030 GHG target is achieved. While the Ideal Scenario in Alternative 1 would deliver more cumulative reductions than the 671 MMTCO2e, Alternative 1 is short about 5 MMTCO2e from achieving the 2030 target. The January Proposed 2030 Target Scoping Plan will include additional policies or measures to illustrate how this alternative could achieve the 2030 target.

25 Percent Reduction in GHGs in Industrial and Oil and Gas Extraction Sectors
To ensure GHG emissions reductions from these facilities that are currently covered by the Cap-and-Trade Program, the State could design and adopt a regulation that would require all facilities within a specific industrial sector to achieve the efficiency of the most efficient facility of that sector in the Cap-and-Trade Regulation by 2030. An efficiency benchmark is reflected as GHG emissions per unit of product. This regulation would not limit mass GHG emissions, but would require facilities to become more efficient through actions such fuel switching, boiler electrification, onsite investments in newer more energy efficient technologies, and any other process efficiencies they could identify and implement. The industrial sectors to which this measure could apply includes: Fossil fuel extraction and product manufacturing, mining, food and beverage processing and manufacturing, mills, refineries, manufacturing (i.e., glass, cement, lime).

As part of evaluating this alternative, ARB has estimated that if every facility in each sector were to increase its production efficiency to the level of the most efficient facility for that sector, the industrial sector could potentially reduce emissions by approximately 25 percent from current levels. Further, since the benchmarks in the Cap-and-Trade Regulation are based on data from actual facilities in these sectors, the data for the most efficient facility represents the production efficiency based on available and in-use technology.

Similar to the 20 percent reduction in GHGs for the refinery sector as described in the draft 2030 Target Scoping Plan Scenario, one initial implementation step for this new industrial sector strategy would be for the State to partner with the local air districts, which traditionally permit these facilities for criteria and toxic air contaminants and use the existing air district BARCT/All Feasible Measures process.

Regulations would need time to be developed and implemented. There would most likely need to be several different regulatory paths based on industry facility size and type. And, while the percent reduction is based on existing data and technology, it does assume production in these sectors does not grow. Therefore, the exact level of reductions may be different pending a rulemaking effort that gathers more detail about specific opportunities for reductions in specific sectors. In order to address emissions leakage, the potential for shifting production out-of-state, and the associated costs on entities, some sectors or sources may be subject to less stringent requirements for reducing their GHG goals for 2030.

5 Percent Increased Utilization of Renewable Natural Gas
Increased utilization of Renewable Natural Gas would reduce the reliance on fossil natural gas in both the core (residential and commercial) and non-core (mostly industrial) sectors. There can be some flexibility as it may be more attractive in some cases to electrify commercial and residential heating systems or replace them with solar heating and consequently just reduce the need for fossil natural gas. The interaction of this increased use of renewable natural gas with the direct GHG reductions for the industrial sectors would need to be further examined to understand any complementary nature and net impact on reductions from the combined actions.

Accelerated retirement of light-duty gasoline vehicles
This action would accelerate natural turnover of light-duty vehicles. It assumes the early retirement of one million vehicles between 2025 and 2030. The vehicles would be replaced with zero-electric vehicles. To implement this action as an incentive program, there would need to be a funding source to support a rebate program (or, potentially a fee-bate program for vehicles) and a mandate such as a requirement to replace the vehicles upon change of ownership. Most people do not replace vehicles unless they must and they have the financial means. In addition, this measure complements the South Coast need to further reduce NOx emissions in order to meet national ambient air quality standards.

Accelerated retirement of natural gas furnaces in residential and commercial buildings
This action would accelerate natural turnover of furnaces and boilers. It assumes the early retirement of 1.2 million residential natural gas furnaces and boilers (along with 358 thousand residential air conditioners) as well as some commercial HVAC systems between 2025 and 2030. The HVAC systems would be replaced with high efficiency electric heat pumps. To implement this action as an incentive program, there would need to be a funding source to support a rebate program and a mandate such as a requirement to replace the assets upon change of ownership. Most people do not replace these items unless they must and they have the financial means.

Implication on Jurisdictional Coordination, Compliance with Clean Power Plan, and Auction Proceeds
As this strategy would not include a Post-2020 Cap-and-Trade Program, the State would need to forgo its existing linkage with Québec and future linkages with other jurisdictions—such as the ones that Ontario and others who are considering linkages with others as part of their action to reduce GHG emissions; identify a new mechanism for compliance for U.S. EPA's Clean Power Plan; and forgo any additional monies generated from auction proceeds for the Greenhouse Gas Reduction Fund.

E. Alternative 2 – Carbon Tax

This strategy includes:

- The known commitments described in Section A
- The 20 percent reduction in GHG emissions at refineries
- A carbon tax

The carbon tax could deliver the remaining GHG emissions reductions to achieve the 2030 target instead of a Cap-and-Trade Program as in the draft 2030 Target Scoping Plan Scenario. In this scenario, a carbon tax would need to deliver approximately 98 MMTCO2e of GHG reductions between 2021 and 2030. The reductions from the other measures would be the same as the known commitments in the draft 2030 Target Scoping Plan Scenario (see Figure lll-2). If the estimated GHG reductions from the known commitments and refineries aren't realized due to delays in implementation, the

carbon tax would need to deliver the additional GHG reductions to ensure the 2030 target is achieved, similar to a Cap-and-Trade program. Alternative 2 would require additional legislative authority, as it is a tax. A potential carbon tax could be set at the same point of regulation for the entities that are currently subject to the California Cap-and-Trade Program, or (alternatively) as far upstream as possible. The amount of the carbon tax is currently under consideration and will be included in the January Proposed 2030 Target Scoping Plan.

Cap-and-trade and a carbon tax are both pricing mechanisms, but there is an important difference. A cap-and-trade program has an emission limit so that the maximum allowable GHG emission level is known and covered entities will have to reduce GHG emissions. With a carbon tax, there is no mechanism to limit the actual amount of GHG emissions at a single or the aggregate covered entities. In other words, cap-and-trade provides environmental certainty while a carbon tax provides some price certainty.

Achieving the 2030 GHG target by using a carbon tax will require setting the right price—a difficult task to do. A set carbon tax may not actually represent the actual cost of abatement for the covered sectors, as the needed GHG reductions may occur at a cost higher than necessary or may not occur at all as there is no limit on emissions and the carbon tax value may not be sufficient to motivate the necessary GHG reductions. And, there is no easy design feature to address trade exposure and to protect against emissions leakage as required under AB 32. One potential strategy to prohibit emissions leakage may be to exempt trade exposed sectors from the carbon tax, but that will shift the burden to the sectors still subject to the tax and may pick "winners" across sectors as some industries may face a carbon cost and others may not. Any such exemptions would need to consider the role any exempt sector is expected to play in the long run, as supporting high carbon intensive or fossil fuel industry may not align well with the State's long-term climate goals.

At the same time, recent information is emerging regarding the efficacy of the carbon tax policy in British Columbia (BC). British Columbia has a jurisdictional goal of reducing its GHG emissions by at least 33 percent below 2007 levels by 2020.[97] BC's current carbon tax is $30 CAD per metric ton of carbon. And, emissions data reveals that BC's GHG emissions per capita have increased in recent years and will fail to meet its 2020 goal.[98,99,100] This highlights the importance of how a carbon tax value is set and may need to change over time and introduces the potential for some uncertainty around political support for higher carbon tax values. And, if data comes to light that such an existing carbon tax is not working to achieve the State's climate goals, additional policies may need to be introduced, such as prescriptive regulations, and they may need to be aggressive to make up for the time where reductions did not materialize as expected.

[97] www2.gov.bc.ca/gov/content/environment/climate-change/policy-legislation-programs/climate-action-legislation#GGRTA
[98] www.americanthinker.com/blog/2016/03/per_capita_ghg_emissions_were_declining_far_more_rapidly_before_bcs_carbon_tax.html
[99] www.huffingtonpost.ca/2015/11/27/b-c-climate-report-says-hike-carbon-tax-extend-reduction-targets-to-2050_n_8667432.html
[100] engage.gov.bc.ca/climateleadership/files/2015/11/CLT-recommendations-to-government_Final.pdf

Implication on Jurisdictional Coordination and Compliance with Clean Power Plan

Pursuing this strategy would also forgo any existing and future linkages as those that exist with the current Cap-and-Trade Program. The State would also need to identify a new mechanism to comply with the Clean Power Plan.

F. Policy Analysis of Draft 2030 Target Scoping Plan Scenario and Alternatives

In evaluating the policies beyond the known commitments, there are several key criteria that are important to consider. These are not exhaustive, but represent high-level considerations for assessing the draft 2030 Target Scoping Plan Scenario and the alternatives. This list does not include the economic analyses as those are provided in more detail in Chapter V (to be released in early 2017). The key criteria are described here and may have already been covered to some extent in the descriptions of the draft 2030 Target Scoping Plan Scenario and alternatives above:

- Ensuring State achieves the 2030 target (SB 32) – The strategy must ensure that GHG emissions reductions occur and are sufficient to achieve the 2030 target.
- Potential to protect against emissions leakage – AB 32 & AB 197 require any policies to achieve the statewide limits to minimize emissions leakage to the extent possible. Emissions leakage can occur when production moves out-of-State so there appears to be a reduction in California's emissions, but the production and emissions have just moved elsewhere. This loss in production may be associated with loss in jobs and decreases in the State's Gross Domestic Product (GDP).
- Develop greenhouse gas reduction programs that can be readily exported to other jurisdictions (AB 32) – Currently, California's Cap-and-Trade Program is linked with Québec's program and is proposing to link with Ontario's cap-and-trade program. At the same time, California's ambitious policies such as RPS and LCFS have resulted in other regions adopting similar programs.
- Compliance Flexibility – Flexibility is important as it allows each regulated entity the ability to pursue its own path towards compliance in a way that works best for its business model. Flexibility also acknowledges that regulatory agencies may not have a complete picture of all available low-cost compliance mechanisms or opportunities even across the same sector. And, under AB 32 and AB 197 the strategy to reduce GHGs requires consideration of cost-effectiveness, which compliance flexibility provides.
- Support the Clean Power Plan and other federal climate programs – The Clean Power Plan is the most prominent federal climate regulation applicable to stationary sources, and California will continue to support aggressive federal action, as well as to defend existing programs like the Clean Power Plan. California power plants are expected to be within their limits as set forth by the State's draft compliance plan. However, the State still needs a mechanism to ensure the emissions for the covered electricity generating plants do not exceed the federal limits. This mechanism must be federally enforceable with regard to

the affected power plants, and limit their emissions in accordance with the federal limit.

- Investment in Disadvantaged and Low-Income Communities, and Low-Income Households – Currently, Cap-and-Trade Auction Proceeds from the sale of State-owned allowances are appropriated for a variety of programs to reduce GHGs, which lead to job creation and economic development. Approximately 35 percent of the monies are to be invested in projects to benefit disadvantaged communities, low-income communities, and low-income households. It is important to understand if the strategy will require or result in funding to support GHG reductions.
- Provide air quality co-benefits – An important concern for environmental justice communities is for any 2030 Target Scoping Plan strategy to achieve air quality co-benefits.
- Avoid or minimize the impacts of climate change on public heath by continuing reductions in GHGs – Climate change has the potential to significantly impact public health, including increases in heat illness and death, air pollution-related exacerbation of cardiovascular and respiratory diseases, injury and loss of life due to severe storms and flooding, increased vector-borne and water-borne diseases, and stress and mental trauma due to extreme weather-related catastrophes.
- Prioritize Rules and Regulations for Direct GHG Reductions – AB 197 requires ARB in developing this 2030 Target Scoping Plan to prioritize emission reduction rules and regulations that result in direct emission reductions at large stationary sources of greenhouse gas emissions sources and direct emission reductions from mobile sources.

Table lll-3 provides an assessment of the draft 2030 Target Scoping Plan Scenario and the alternatives when compared to the policy objectives provided above.

Table III-3. Comparison of Strategies to Achieve the 2030 Target

Strategy	Ability to Reduce GHGs to Meet 2030 Target	Potential to Protect against Emissions Leakage	Support the development of integrated and cost-effective regional, national, and international GHG reduction programs	Compliance Flexibility	Support the Clean Power Plan and federal climate programs	Funding	Air Quality Co-Benefits	Public Health Benefit	Prioritize Rules and Regulations for Direct Emission Reductions
Draft 2030 Target Scoping Plan Scenario Known Commitments + Refinery Regulations + Post-2020 Cap-and-Trade Program with Declining Caps	Modeling demonstrates this scenario can achieve the 2030 target	Free allocation to minimize leakage, where identified	Supports existing and future WCI linkages, allows for larger GHG emissions reductions through collaborative regional efforts, including regional trading for 111(d)	Yes	Post-2020 Cap-and-Trade Program is currently proposed to be the compliance demonstration mechanism for CA for the Clean Power Plan.	Existing Cap-and-Trade auction structure would continue to support GGRF and its programs for Disadvantaged Communities and local transit projects, among others.	Yes	Yes	Yes
Alternative 1 No Cap-and-Trade Scenario	Current modeling falls 5 $MMTCO_2e$ short in meeting the 2030 target. This will be fully addressed for the January draft	Fewer options for minimizing leakage	Limited opportunities for linkages	Limited compliance flexibility	No, need to identify new mechanism for Clean Power Plan compliance, such as direct GHG limits on power plants	No auction proceeds for GGRF or programs funded by GGRF. Need to identify new funding mechanisms for incentives to replace and retire older assets	Yes	Yes	Yes

Strategy	Ability to Reduce GHGs to Meet 2030 Target	Potential to Protect against Emissions Leakage	Support the development of integrated and cost-effective regional, national, and international GHG reduction programs	Compliance Flexibility	Support the Clean Power Plan and federal climate programs	Funding	Air Quality Co-Benefits	Public Health Benefit	Prioritize Rules and Regulations for Direct Emission Reductions
Alternative 2 Carbon Tax	No certainty	Fewer options for minimizing leakage, may include exempting some sectors	Limited opportunities for linkages	Yes	No, need to identify new mechanism for Clean Power Plan compliance, such as direct limits on power plants	Yes, carbon tax revenues could be used to fund GGRF program, or other uses	Yes	Yes	Yes

IV. Achieving Success

A. Personal Action – JANUARY DRAFT

B. State and Local Government Considerations

Local governments play an important role in achieving the State's long-term greenhouse gas (GHG) goals because they have broad influence, and sometimes-exclusive authority, over activities that contribute to significant direct and indirect greenhouse gas emissions. This includes their community scale planning and permitting processes, discretionary actions, local codes and ordinances, outreach and education efforts, and municipal operations. Local government efforts to reduce emissions within their jurisdiction can also provide important co-benefits, including improved air quality, local economic benefits, more sustainable communities, and an improved quality of life.

1. Climate Action with Local Permitting

Although the draft 2030 Target Scoping Plan focuses on State agency actions necessary to achieve the 2030 GHG limit, local governments are essential partners in achieving California's goals to reduce GHG emissions. The 2030 target will require an increase in the rate of emission reductions compared to what was needed to achieve the 2020 limit, and this will require action and collaboration at all levels, including local government action to complement and support State level actions. Cities and counties are already setting targets, developing climate action plans (CAP), and making progress toward reducing emissions. The Statewide Energy Efficiency Collaborative and ICLEI recently released a report, *The State of Local Climate Action: California 2016*[101], which highlights local government efforts, including:

- In California, 60 percent of cities and over 70 percent of counties have completed a GHG inventory and 42 percent of local governments have completed a climate, energy or sustainability plan that directly addresses GHG emissions. Many other community scale local plans such as general plans have emissions reductions measures incorporated as well (see Governor's Office of Planning and Research [OPR] Survey questions 23 and 24).[102]
- Over one hundred California local governments have developed emissions reduction targets that, if achieved, would result in a reduction of more than 45 million tons CO_2-equivalent (CO_2e) each year by 2020, and 83 million tons CO_2e each year by 2050.

Local air pollution control and air quality management districts (air districts) have a key role to play in reducing regional and local sources of GHG emissions. Because many actions to reduce air pollutants also reduce GHG emissions, many air districts are actively integrating climate protection into air quality programs. Air districts also support

[101] State of Local Climate Action: California 2016. californiaseec.org/wp-content/uploads/2016/10/State-of-Local-Climate-Action-California-2016_Screen.pdf
[102] www.opr.ca.gov/docs/2016_APS_final.pdf

local climate protection programs, by providing technical assistance and data, quantification tools, and even funding.[103] Furthermore, local metropolitan planning organizations (MPOs) support the State's climate action goals via adopted "sustainable communities strategies" (SCSs) required by the Sustainable Communities and Climate Protection Act of 2008 (SB 375, Chapter 728, Statutes of 2008). Per SB 375, the California Air Resources Board (ARB) has set regional targets for GHG emissions reductions from passenger vehicle use for 2020 and 2035, which are periodically reviewed and updated. Each of California's MPOs must prepare an SCS as an integral part of its regional transportation plan (RTP). The SCS contains land use, housing, and transportation strategies that allow the region to meet its GHG emission reduction targets.

Recommended Local Plan Level Greenhouse Gas Emissions Reduction Goals

ARB recommends that local governments aim to achieve community-wide goal to achieve emissions of no more than six metric tons CO_2e per capita by 2030 and no more than two metric tons CO_2e per capita by 2050.[104] Per capita and mass emissions goals are consistent with the statewide emissions limits established in AB 32, SB 32, and Executive Order S-3-05 and B-30-15.[105] Service population goals allow for linkages with metropolitan planning organization reductions required under SB 375. In order to develop a GHG mitigation strategy to achieve these targets, local governments should refer to "The U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions" which provides detailed guidance on completing a GHG emissions inventory at the community scale in the United States – including emissions from businesses, residents, and transportation. Tools such as ClearPath California, which CPUC funded and ARB and OPR represented California on the steering committee, may also be used to support analysis of community scale GHG emissions.

From the perspective of California's international agreements, these goals are also consistent with the Under 2 MOU (Memorandum of Understanding) that California originated with Baden-Württemberg and has now been signed or endorsed by 170 jurisdictions representing 33 countries and six continents.[106,107] Central to the Under 2 MOU is that all signatories agree to reduce their GHG emissions to two metric tons CO_2e per capita by 2050. This limit represents California's and these other governments' recognition of their "fair share" to reduce GHG emissions to the scientifically based levels necessary to limit global warming below two degrees Celsius.

---

[103] Examples include: (1) Bay Area Air Quality Management District (BAAQMD). *2016 Clean Air Plan and Regional Climate Protection Strategy*. Available at: www.baaqmd.gov/plans-and-climate/air-quality-plans/plans-under-development ; (2) California Air Pollution Control Officers Association. California Emissions Estimator Model (CalEEMod). Available at: www.caleemod.com/ ; (3) San Joaquin Valley Air Pollution Control District. Grants & Incentives. Available at: valleyair.org/grants/ ; (4) BAAQMD. Grant Funding. Available at: www.baaqmd.gov/grant-funding ; (5) South Coast Air Quality Management District. Funding. Available at: www.aqmd.gov/grants-bids/funding ; (6) Sacramento Metropolitan Air Quality Management District. Incentive Programs. Available at: www.airquality.org/Residents/Incentive-Programs .

[104] These goals are appropriate for the plan level (city, county, subregional, or regional level, as appropriate), not for specific individual projects because they include all emissions sectors in the State.

[105] This number represents the 2030 and 2050 limits divided by total population projections from California Department of Finance.

[106] See under2mou.org/founding-signatories/. California signed the Under 2 MOU on May 19, 2015. See under2mou.org/wp-content/uploads/2015/05/California-appendix-English.pdf and under2mou.org/wp-content/uploads/2015/05/California-Signature-Page.pdf.

[107] The Under 2 MOU signatories include jurisdictions ranging from cities to countries to multiple-country partnerships. Therefore, like the goals set forth above for local and regional climate planning, the Under 2 MOU is scalable to various types of jurisdictions.

This limit is also consistent with the Paris Agreement, which sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to below 2°C.[108] This local government recommended goal expands upon the reduction of 15 percent from "current" (2005-2008) levels by 2020 previously recommended in the 2008 Scoping Plan.[109] This is a statewide goal based on all emissions sectors in the State, and local jurisdictions may choose to derive region-specific evidenced based per capita or per service population GHG emissions goals tied to these statewide goals. Once adopted, the plan and policies to achieve this goal can serve as a performance metric for subsequent projects.

The State must accommodate population growth and economic growth in a far more sustainable manner than in the past. While State-level investments, policies, and actions play an important role in shaping growth and development patterns, regional and local governments and agencies are uniquely positioned to influence the future of the built environment and its associated GHG emissions. Contributions from policies and programs such as renewable energy and energy efficiency are helping achieve the near-term 2020 target, but longer-term targets cannot be achieved without land use change that allows more efficient use and management of land and infrastructure. Local governments have primary authority to plan, zone, approve, and permit how and where land is developed to accommodate population growth, economic growth, and the changing needs of their jurisdictions. Land use decisions affect GHG emissions associated with transportation, water use, wastewater treatment, waste generation and treatment, energy consumption, and conversion of natural and working lands. Local land use decisions also play a particularly critical role in reducing GHG emissions associated with the transportation sector, both at the project level, and in long-term plans, including general plans, local and regional climate action plans, specific plans, transportation plans, and supporting sustainable community strategies developed under SB 375 among others. While the State can do more to accelerate and incentivize these local decisions to better align with mutual State and local climate and other goals, local actions that reduce vehicle miles travelled (VMT) are also necessary for meeting transportation sector specific goals and achieving the 2030 target under SB 32.

Climate action plans allow a local government or region to look holistically at regional GHG emissions and local strategies to support to the statewide GHG limit. GHG strategies in CAPs can also lead to important co-benefits, such as improved air quality, local economic benefits such as green jobs, more transportation choices, improved public health and quality of life, protection of locally-, statewide-, and globally-important natural resources, and more equitable sharing of these benefits across communities. These plans should include the carbon sequestration values associated with natural and working lands, as well as the importance of jurisdictional lands with regards to water, habitat, agricultural, and recreational resources. Numerous examples of plan-level GHG reduction actions that can be implemented by local governments are listed in Appendix E (to be released in early 2017).

[108] unfccc.int/paris_agreement/items/9485.php
[109] 2008 Scoping Plan, page 27.

Sufficiently detailed and adequately supported GHG reduction plans (including CAPs) also provide local governments and project applicants with a valuable tool for streamlining project-level environmental review. For example, under the California Environmental Quality Act (CEQA), individual projects that comply with the strategies and actions within an adequate local CAP can streamline the project specific GHG analysis.[110] The California Supreme Court in a recent decision expressly called out this provision in CEQA that allows tiering from a geographically specific GHG reduction plan.[111] The court also recognized that GHG determinations in CEQA should be consistent with the statewide Scoping Plan goals, including the State's long-term 2050 goals.[112] The recommended local government goals of six metric tons CO_2e per capita by 2030 and no more than two metric tons CO_2e per capita by 2050 are intended to provide consistency with the 2030 Target Scoping Plan and the State's long term goals. Knowing that the per capita emissions goals may not be appropriate in some jurisdictions, mass emissions and service population emissions are also important to discuss. Per the community protocol, a local government should focus on those emissions that the jurisdiction controls, while disclosing emissions within its geographical boundary but for which the local government does not have regulatory authority.

Project-Level Greenhouse Gas Emissions Reduction Actions and Thresholds

For transportation projects or transportation components of projects that affect amounts and patterns of vehicle travel, refer to OPR's guidance on CEQA VMT thresholds of significance and for examples of VMT mitigation.

Beyond plan level actions, local governments can also support the State's goals when considering discretionary approvals and entitlements of individual projects through CEQA. Absent conformity with an adequate geographically specific GHG reduction plan, ARB recommends that all new land use development implement all feasible measures to reduce GHG emissions to do its "fair share" in supporting the State's goals.[113]

Several recent examples of sustainable land use development projects in California have demonstrated that it is feasible to design projects that achieve zero net additional GHG emissions. For example, several projects have received certification from the Governor under The Jobs and Economic Improvement through Environmental Leadership Act (AB 900, statutes of 2011), demonstrating an ability to design economically viable projects that create jobs, while not contributing any net additional GHG emissions.[114] Another example is the Newhall Ranch Resource Management and Development Plan and Spineflower Conservation Plan, in which the applicant, Newhall Land and Farming Company, proposed a commitment to achieve net zero GHG

[110] CEQA Guidelines, § 15183.5, sub. (b).
[111] *Center for Biological Diversity v. California Dept. of Fish and Wildlife* (2015) 62 Cal.4th 204, 229-230.
[112] *Id*. at *pp.* 223-224.
[113] This is where there is no adequate CAP to tier from as discussed earlier.
[114] www.opr.ca.gov/s_californiajobs.php

emissions for a very large-scale residential and commercial specific plan development in Santa Clarita Valley.[115]

ARB believes that achieving no net increase in GHG emissions is the correct overall objective but may not be appropriate or feasible for every development project, and the inability to mitigate a project's GHG emissions to zero does not necessarily imply a substantial contribution to the cumulatively significant environmental impact of climate change under CEQA. Lead agencies may develop evidenced based bright-line numeric thresholds consistent with the 2030 Target Scoping Plan and the State's long term goals, and projects with emissions over that amount may be required to incorporate on-site design features and mitigation measures that avoid or minimize project emissions to the degree feasible.[116] Otherwise, a performance-based metric using a climate action plan or other plan to reduce GHG emissions is appropriate.

To the degree a project relies on GHG mitigation measures, ARB recommends that lead agencies prioritize on-site design features and direct investments in GHG reductions in the vicinity of the project to take advantage of potential co-benefits of reducing other pollutants (criteria and toxic air contaminants) in the surrounding neighborhoods or communities and generating local economic benefits. For example, direct investment in a local building retrofit program can pay for cool roofs, solar panels, solar water heaters, smart meters, energy efficient lighting, energy efficient appliances, energy efficient windows, insulation, and water conservation measures for homes within the geographic area of the project. This type of local program generates real demand side benefits and keeps local jobs, while creating the market signals for energy efficiency materials and goods, some of which can be and are currently produced in California. Other examples of local direct investments include financing installation of regional electric vehicle (EV) charging stations, paying for electrification of public school buses, and investing in local urban forests. Where further project design or regional investments are infeasible or not proven to be effective, it may be appropriate and feasible to mitigate project emissions through purchasing and retiring carbon credits issued by a recognized and reputable accredited carbon registry. Appendix E (to be released in early 2017) includes other examples of on-site project design features, mitigation measures, and direct regional investments that may be feasible to minimize GHG emissions from land use development projects.

2. ARB Support for Local Action

ARB continues to encourage local governments to adopt climate action plans and to track their progress toward reducing municipal and community-wide emissions. In 2009, ARB adopted a "local government toolkit" which can be found on CoolCalifornia.org, an

[115] www.wildlife.ca.gov/regions/5/newhall

[116] ARB provided some guidance on developing project thresholds in a paper issued in October 2008, which included a concept utilizing a bright-line mass numeric threshold based on capturing approximately 90 percent of emissions in that sector and a concept of minimum performance based standards. Some districts built upon that work to develop thresholds. For example, Santa Barbara County adopted a bright-line numeric threshold of 1,000 $MTCO_2e$/yr for industrial stationary-source projects and Sacramento Metropolitan Air Quality Management District adopted a 10,000 $MTCO_2e$/yr threshold for stationary source projects and a 1,100 $MTCO_2e$ threshold for construction activities and land development projects in their operational phase. ARB is not endorsing any one of these approaches.

informational website which serves as ARB's main mechanism for inspiring and facilitating voluntary climate actions (for local governments, small businesses, schools, and households). Specific guidance for addressing GHG emissions in general plans and related documents are forthcoming from OPR's General Plan Guidelines.

The local government toolkit includes local government success stories, a Funding Wizard tool that connects local governments with available funding opportunities for sustainable projects, and CAP templates and monitoring and tracking tools developed through the Statewide Energy Efficiency Collaborative in coordination with ARB and OPR, including tools to quantify GHG emissions from both municipal operations and the community at large that are available through ICLEI's ClearPath tool (which is free for all California jurisdictions to use).

ARB is also now developing a centralized database and map that will allow local governments to view and compare emission inventories, reduction targets, climate action planning strategies, and other climate planning materials. This information will help jurisdictions around California identify what climate action strategies are working in other, similar jurisdictions across the State, and will facilitate collaboration among local governments pursuing GHG reduction strategies and goals. This database and map will be featured on the CoolCalifornia.org website and are anticipated to be available in 2017. Additional information on activities local governments are engaged with will be co-hosted between Cal-Adapt (www.cal-adapt.org), OPR (www.opr.ca.gov), and Cool California (www.CoolCalifornia.org). Annual surveys of local government action on climate change are provided by the OPR Annual Planning Survey – 2016 Version.[117] Question 23 of the 2016 Survey asked, "Does your jurisdiction have plans, policies and/or programs to reduce greenhouse gas emissions? If yes, in what document are these policies located." Survey recipients were asked to check all that applied.

CoolCalifornia City Challenge

To engage communities in reaching the State's climate goals, ARB has partnered with Energy Upgrade California on the CoolCalifornia Challenge, which recently completed its third competition between California cities to reduce carbon footprints of residents, and build more vibrant and sustainable communities. Twenty-two cities participated in the 2015-2016 Challenge, which engaged nearly 3,200 households to take energy savings actions to reduce their carbon footprint. In total, the participants reported that they completed actions that will save 5,638 metric tons of carbon dioxide over the energy saving actions' lifetime, equivalent to removing more than 2,500 California homes from the grid or over 1,000 automobiles from the road for a year.

[117] www.opr.ca.gov/docs/2016_APS_final.pdf

C. International Coordination

California is committed to working at the international level to reduce global GHG emissions. Pursuant to the AB 32 requirement for ARB to "consult with other states, the federal government, and other nations to identify the most effective strategies and methods to reduce greenhouse gases, manage greenhouse gas control programs, and to facilitate the development of integrated and cost-effective regional, national, and international greenhouse gas reduction programs," ARB and other State agencies regularly engage with interested jurisdictions outside of California to share best practices, build capacity, and pioneer new policy tools. These activities are successfully assisting in implementing a variety of climate and air quality programs around the world, supporting other countries in making more meaningful climate commitments under the Paris Agreement and other initiatives, and improving the health of their citizens.

The Brown Administration has signed MOUs with many subnational and national jurisdictions around the world to address climate change and air pollution.[118] As a result, ARB is building partnerships with jurisdictions that are developing air quality and greenhouse gas reduction programs. The two countries with which we have the strongest partnerships are China and Mexico.

In April 2013, Governor Brown led a delegation of California government and business leaders to Beijing and several Chinese provinces. California signed MOUs pledging cooperation in developing clean technology, reducing pollution, and exchanging information on climate mitigation policies with the Beijing Environmental Protection Bureau, the Ministry of Environmental Protection, and Guangdong Province. In June 2013, California and Shenzhen, China, signed an MOU to work together to share policy design and early experiences from their provincial pilot emissions trading systems (ETS) and China's national ETS, which is expected to launch in 2017. ARB supports these MOUs through a continuing series of exchanges of in-depth policy and technical information.

In June 2014, the Governor signed an MOU with Mexico, pledging cooperation on ETS and vehicle emissions, as well as forest management, air quality, and wildfires. Work is underway to update smog-forming and GHG emission standards for Mexico's light- and heavy-duty vehicle programs, and ARB has provided technical expertise to regulators in Mexico to inform this process.

California also engages in multi-lateral forums that help develop the policy foundation and technical infrastructure for GHG regulations in multiple jurisdictions. Recognizing that many efforts were under way around the world to use market forces to motivate GHG emission reductions, California worked with other governments to establish the International Carbon Action Partnership (ICAP) in 2007. The ICAP provides a forum for

[118] California Climate Change: International Collaboration Website: www.climatechange.ca.gov/climate_action_team/partnerships.html

sharing experiences and knowledge among jurisdictions that have already implemented or are actively pursuing market-based GHG programs.[119]

California has also participated in meetings of the Partnership for Market Readiness (PMR), a multilateral World Bank initiative that brings together more than 30 developed and developing countries to share experiences and build capacity for climate change mitigation efforts, particularly those implemented using market instruments.[120] In November 2014, ARB became a Technical Partner of the PMR, and ARB staff members have provided technical information on the design and implementation of the Cap-and-Trade program at several PMR meetings.

Recognizing the need to address the substantial GHG emissions caused by the deforestation and degradation of tropical forests, California worked with a group of subnational governments to form the Governors' Climate and Forests Task Force (GCF) in 2008.[121] The GCF is currently comprised of 35 different subnational jurisdictions -- including states and provinces in Brazil, Colombia, Indonesia, Ivory Coast, Mexico, Nigeria, Peru, Spain, and the U.S. -- that are contemplating or enacting programs for low emissions rural development and reduced emissions from deforestation and land use. GCF members continue to engage in discussions to share information and experiences about the design of such programs and how the programs could potentially interact with carbon markets. Ongoing engagement between California and its GCF partners, as well as ongoing discussions with other stakeholders, continues to provide lessons on how such programs could fit within California's Cap-and-Trade Program.

ARB staff identified the jurisdictional program in Acre, Brazil as a program that is ready to be considered for linkage with California, and has committed to proposing regulatory standards for assessing tropical forestry programs and to proposing a linkage with the program in Acre as part of a future rulemaking process. From October 2015 to April 2016, ARB held public workshops that addressed the potential of approving the use of sector-based offset credits from the tropical forestry sector within the Cap-and-Trade Program. ARB will conduct additional stakeholder engagement before proposing any regulatory amendments.

Linkage with a state-of-the-art, jurisdictional sector-based offset program can provide significant benefits to California's Cap-and-Trade Program by assuring an adequate supply of high-quality compliance offsets to keep the cost of compliance within reasonable bounds, up to the quantitative usage limit for sector-based offsets. Linkage would also support California's broad climate goals, as well as global biodiversity and tropical forest communities. Furthermore, reducing emissions from tropical deforestation is a key topic within the United Nations Framework Convention on Climate Change (UNFCCC) and between national and subnational jurisdictions, including through collaboration between California and the U.S. Department of State. Continued evaluation of the tropical forestry sector and other sector-based offset programs further

[119] International Carbon Action Partnership Website: icapcarbonaction.com/
[120] Partnership for Market Readiness Website: www.thepmr.org/
[121] Governors' Climate and Forests Task Force Website: www.gcftaskforce.org/

demonstrates California's ongoing climate leadership and could result in partnering on other mutually beneficial climate and low emissions development initiatives, including measures to encourage sustainable supply chain efforts by public and private entities.

One of the Brown Administration's priorities for 2015 was to highlight California's climate leadership on the subnational level, and to ensure that subnational activity was an element of the Paris Agreement on climate change, which was negotiated at the 21st Conference of the Parties (COP 21) to the UNFCCC in December 2015. In the year preceding the Paris negotiations, the Governor's Office recruited subnational jurisdictions to sign onto the Memorandum of Understanding on Subnational Global Climate Leadership (Under 2 MOU), which brings together states and regions willing to commit to reducing their GHG emissions by 80 to 95 percent, or to limit emissions to 2 metric tons CO_2-equivalent per capita, by 2050. The Governor led a California delegation to the Paris negotiations to highlight our successful climate programs and to champion subnational action and international cooperation on meeting the challenge of reducing GHG emissions. By the time of the Paris negotiations, 127 jurisdictions had joined California in the Under 2 MOU, including many jurisdictions partnering with California in some of the other above-described efforts.[122]

Many foreign jurisdictions seek out California's expertise because of our history of success in addressing air pollution and climate change. California also benefits from these interactions. Expanding global action to fight air pollution and climate change expands markets for clean technology. This can bolster business for those companies in California developing clean energy products and services and help to bring down the cost of those products globally and in California. Additionally, innovative policies and lessons learned in our partners' jurisdictions can help inform future climate policies in California.

The Governor's focus on subnational collaborations on climate change and air quality has strengthened and deepened California's existing international relationships and forged new ones. These relationships are a critical component of reducing emissions of GHGs and other pollutants worldwide. As we move forward, ARB and other State agencies will continue to communicate and collaborate with international partners to find the most cost-effective ways to improve air quality and fight climate change, and to share California's experience and expertise in reducing air pollution and GHGs while growing a vibrant economy.

D. Innovation – JANUARY DRAFT

E. Implementation of the 2030 Scoping Draft Plan – JANUARY DRAFT

F. Public Outreach and Education – JANUARY DRAFT

[122] Under 2 MOU Website: under2mou.org/

V. Evaluations – JANUARY DRAFT

A. AB 197 Measure Analyses – JANUARY DRAFT

For each scoping plan update, Assembly Bill 197 (AB 197, Garcia, Chapter 250, Statutes of 2016) requires the following for each reduction measure:

- The range of projected greenhouse gas emissions reductions that result from the measure
- The range of projected air pollution reductions that result from the measure
- The cost-effectiveness, including avoided social costs, of the measure.

This section provides the required details for the measures included in the 2030 Target Scoping Plan Scenario and the alternatives. As many of the known commitments are existing plans, the data provided below is taken from analyses already completed for those plans. In these instances, we provide the citation for the source of that data. For new measures that are identified for the first time in this plan, estimates are provided with the relevant assumptions. In the January Proposed 2030 Target Scoping Plan, Table V-1 will provide the emissions reductions ranges for the measures evaluated in the modeling scenarios.

Table V-1. Ranges of Projected GHG and Air Pollution Reductions by Policy or Measure in 2030

Measure	Range of GHG Reductions MMT CO_2e*	Range of Air Pollution Reductions	
50% Renewables Portfolio Standard (RPS)			
Mobile Source Strategy (vehicle measures)			
20% Refinery Measure			
Short-Lived Climate Pollutant Strategy			
Low Carbon Fuel Standard (LCFS) Carbon Intensity 18%			
60% RPS			
Low Carbon Fuel Standard (LCFS) Carbon Intensity 25%			
30% Refinery			
25% Industry			
25% Oil and Gas			
Renewable Natural Gas (RNG) 5% core and non-core			
Accelerated heat pumps &			

Measure	Range of GHG Reductions MMT CO_2e*	Range of Air Pollution Reductions	
accelerated retirement of space heating			
Mobile Source Strategy (CFT) with Increased ZEVs in South Coast & early retirement of LDVs with more efficient LDVs			
Energy efficiency			
Behind the meter PV			
Demand response and flexible load			
Cap-and-Trade Program			
Carbon Tax			

*The ranges when summed together may not match the total GHG reductions for the modeled scenarios in PATHWAYS as these estimates do not capture any interactions between the sectors. Also, some of the ranges are from standalone analyses completed on the specific measure as part of an approved or draft plan.

Table V-2. Cost by Policy or Measure in 2030

Measure			
50% RPS			
Mobile Source Strategy w/ LCFS CI 18%			
20% Refinery			
Short-Lived Climate Pollutant Strategy			
Cap-and-Trade Program			
60% RPS			
LCFS CI 24%			
30% Refinery			
25% Industry			
25% Oil and Gas			
RNG 5% core and non-core			
Accelerated heat pumps			
Accelerative roll-over of gasoline LDVs			
Mobile Source Strategy with Increased ZEVs in South Coast			

B. Economic Modeling – JANUARY DRAFT

1. Social Cost of Carbon

Recent discussions with stakeholders and members of the California Legislature have touched upon the potential role of the Social Cost of Carbon (SC-CO_2) in the development of this Discussion Draft. Consideration of social costs is a requirement in AB 197 including evaluation of cost-effectiveness for measures within this Discussion Draft. The U.S. Environmental Protection Agency (U.S. EPA) describes SC-CO_2 as follows:

> *EPA and other federal agencies use the social cost of carbon (SC-CO_2) to estimate the climate benefits of rulemakings. The SC-CO_2 is an estimate of the economic damages associated with a small increase in carbon dioxide (CO_2) emissions, conventionally one metric ton, in a given year. This dollar figure also represents the value of damages avoided for a small emission reduction (i.e., the benefit of a CO_2 reduction).*
>
> *The SC-CO_2 is meant to be a comprehensive estimate of climate change damages and includes, among other things, changes in net agricultural productivity, human health, property damages from increased flood risk and changes in energy system costs, such as reduced costs for heating and increased costs for air conditioning. However, it does not currently include all important damages. The IPCC Fifth Assessment report observed that SC-CO_2 estimates omit various impacts that would likely increase damages. The models used to develop SC-CO_2 estimates do not currently include all of the important physical, ecological, and economic impacts of climate change recognized in the climate change literature because of a lack of precise information on the nature of damages and because the science incorporated into these models naturally lags behind the most recent research. Nonetheless, the SC-CO_2 is a useful measure to assess the benefits of CO_2 reductions.*[123]

There continues to be active discussion within government and academia about the role of SC-CO_2 in assessing regulations, quantification of avoided climate damages, and the monetary values themselves. To date, federal Agencies have used SC-CO_2 in evaluating regulations including U.S. EPA, Department of Energy, and Department of Transportation.

The Intergovernmental Panel on Climate Change (IPCC) has stated that SC-CO_2 estimates are likely underestimated due to the omission of significant impacts that cannot be accurately monetized.[124] In addition, the SC-CO_2 does not account for impacts related to changes in criteria pollutants or toxics resulting from GHG focused policies and programs.

[123] www3.epa.gov/climatechange/Downloads/EPAactivities/social-cost-carbon.pdf
[124] www.ipcc.ch/publicationsanddata/ar4/wg3/en/ch3s3-5-3-3.html

It is the cost-effectiveness of regulations and policies that is most often examined. SC-CO_2 allows California to begin to examine the costs of no action, or damages. At the same time, it is important to note that the cost of GHG abatement, or reductions in GHGs, does not equal the potential economic impacts resulting from the emission of GHGs. Currently, new policies and measures are evaluated for their cost of implementation, or cost of abatement of GHGs on emitters and on the California economy.

There may be technologies or policies that don't appear to be cost-effective when compared to the SC-CO_2 associated with the avoided GHG reductions. But, these actions may result in other benefits that are not reflected in the SC-CO_2 including diversification of the portfolio of transportation fuels (a goal outlined in the Low Carbon Fuel Standard) and reductions in criteria pollutant emissions from power plants (as in the Renewables Portfolio Standard). Regulatory mandates help to broaden the deployment of these technologies and address market failures. Policies may also reduce the cost of production and utilization of lower carbon technologies over time, helping the State achieve its climate goals and potentially providing other economic benefits such as clean economy jobs.

This Discussion Draft incorporates the concept of the social cost of carbon in two ways. It includes a range for the economic benefits that occur as a result of the avoided environmental damage that result from achieving the 2030 target. This Discussion Draft also follows through on a recommendation from the Environmental Justice Advisory Committee (EJAC) to consider the Social Cost of Carbon in a potential path to achieving the 2030 target. This latter recommendation is included in the Carbon Tax Alternative, which incorporates social cost evaluation into the setting of a carbon tax. The State shall continue to monitor and engage in discussions related to any updates to U.S. EPA's SC-CO_2 methods and values.

2. **Macro-Economic Modeling Results JANUARY DRAFT**

3. **Impacts on Specific Business Sectors JANUARY DRAFT**

4. **Household Impacts JANUARY DRAFT**

C. Public Health

Addressing climate change could represent the greatest opportunity to improve public health in our time (Watts, et al., 2015). Many measures to reduce greenhouse gas (GHG) emissions also have significant health co-benefits that can address climate change *and* improve the health and well-being of all populations across the State. Climate change is already impacting the health of communities (USGCRP, 2016). Climate-related health impacts can include increased heat illness and death, increases in air pollution-related exacerbation of cardiovascular and respiratory diseases, injury and loss of life due to severe storms and flooding, increased vector-borne and water-

borne diseases, and stress and mental trauma due to extreme weather-related catastrophes (USGCRP, 2016). The urgency of action to address the impacts already being felt from a changing climate and the threats in coming decades, provides an unprecedented opportunity for California's leadership in climate action to reduce GHG emissions and create healthy, equitable, and resilient communities where all people thrive. This section talks about the link between climate change and public health. It does not analyze the specific measures included in the strategy but provides context for assessing the potential measures and scenarios.

Achieving Health Equity through Climate Action

Many populations in California face *health inequities,* or unfair and unjust health differences between population groups that are systemic and avoidable (Whitehead, 1992). Differences in environmental and socioeconomic determinants of health result in these health inequities. Those facing the greatest health inequities include low-income individuals and households, the very young and the very old, communities of color, those who have been marginalized or discriminated against based on gender or race/ethnicity (CDPH, 2015). It is these very same populations, along with those suffering existing health conditions and certain populations of workers (e.g. outdoor workers), that climate change will most disproportionately impact (Shonkoff, et al., 2011). The inequitable distribution of social, political and economic power results in health inequities, while perpetuating systems (e.g. economic, transportation, land use, etc.) that drive GHG emissions. As a result, communities face inequitable living conditions, such as low-income communities of color living in more polluted areas, facing climate change impacts that compound and exacerbate existing sensitivities and vulnerabilities (Shonkoff, et al., 2011; Rudolph & Gould, 2015). Fair and healthy climate action requires addressing the inequities that create and intensify community vulnerabilities. The capacity for climate resilience is significantly driven by living conditions and the forces that shape them, such as income, education, housing, transportation, environmental quality, and access to services. Thus, strategies such as alleviating poverty, increasing access to opportunity, improving living conditions, and reducing health and social inequities will result in more climate-resilient communities. In fact, there are already many "no-regret" climate mitigation and adaptation measures available (discussed below) that can reduce health burdens, increase community resilience, and address social inequities (Watts, et al., 2015). Focusing efforts to achieve health equity can thus lead to significant progress in addressing human-caused climate change.

Potential Health Impacts of Climate Change Mitigation Measures

Socioeconomic Factors: Income, Poverty & Wealth

Economic factors, such as income, poverty, and wealth, are collectively one of the largest determinants of health. As such, climate mitigation measures that yield economic benefits can significantly improve population health, especially if the economic benefits are directed to those most vulnerable and disadvantaged (including those living in poverty) who often face the most health challenges. From the poorest to richest ends of the income spectrum, higher income is associated with greater longevity in the U.S. (Chetty et al., 2016, Marmot, et al., 2008, Woolf, et al., 2011). The gap in life

expectancy between the richest one percent and poorest one percent of Americans was almost 15 years for men in 2014, and about ten years for women (Chetty et al., 2016). Early death among those living in poverty is not a result of those with higher incomes having better access to quality health care (Chetty et al., 2016). Only about 10-20 percent of a person's health status is accounted for by health care (and 20-30 percent attributed to genetics), while the remainder is attributed to the social determinants of health, which include environmental quality, social and economic circumstances, and the social, media, policy, economic, retail, and built environments, all of which in turn shape stress levels and behaviors, including smoking, diet, and exercise (DHHS PHS, 1980; McGinnis & Foege, 1993; Lantz, et al., 1998; McGinnis, et al., 2002; Mokdad, et al., 2004; Danaei, et al., 2009; WHO, 2009; Booske, et al., 2010; Stringhini, et al., 2010; Thoits, 2010; McGovern et al., 2014). In fact, where people live, work, learn, and play is often a stronger predictor of life expectancy than their genetic and biological makeup (Iton, 2006). The World Health Organization's Commission on the Social Determinants of Health concluded that the poor health of poor people, and the social gradient in health, are caused by the unequal distribution of power, income, goods, and services resulting from poor social policies and programs, unfair economic arrangements, and bad politics (Marmot, et al., 2008). Thus, improving the conditions of daily life and tackling the inequitable distribution of power, money, and resources can remedy inequitable health outcomes (Marmot, et al., 2008). Simply put, the more evenly distributed the wealth, the healthier that society is (Smith, 1996).

The *wealth-health gradient* has significant implications for the 2030 Target Scoping Plan. State climate legislation and policies require prioritizing GHG reduction strategies that serve vulnerable populations and improve well-being for disadvantaged communities. As such, strategies that improve the financial security of communities facing disadvantage while reducing GHG emissions are win-win strategies. These include providing funds or services for GHG reduction programs (e.g. weatherization, energy efficiency, renewable energy, ZEVs, transit, housing, and others) to low-income individuals and households to help them reduce costs. Among the poorest 25 percent of people, per capita government expenditures are strongly associated with longer life spans (Chetty, et al., 2016). Successful strategies California has already implemented to assure the poor do not pay higher costs for societal GHG reductions include low-income energy discount programs, in combination with direct climate credits, and policies and programs that help Californians reduce electricity, natural gas, and gasoline consumption (Gattaciecca, et al., 2016). More such strategies could be pursued. In order to tackle the inequitable distribution of power that leads to disparate health outcomes, agencies can first assure they have robust structures for civic engagement so that people facing health inequities can themselves participate in decision-making about solutions. Whether it is absolute poverty or relative deprivation that leads to poor health, investments and policies that both lift up the poor and reduce wealth disparities will address the multiple problems of climate change mitigation, adaptation, and health inequities.

Employment

Employment status impacts human health in many ways. Poor health outcomes of

unemployment include premature death, self-rated ill-health (a strong predictor of poor health outcomes), and mental illness (Krueger & Burgard, 2011; Rogers, et al., 2000; Ross & Mirowsky, 1995, Burgard & Lin, 2013). Economic strain related to unemployment can impact mental health and trigger stress that is linked to other health conditions (Price, et al., 1998; Price, et al., 2002). Populations of color are overrepresented in the unemployment and under-employment ranks, which likely contributes to racial health inequities. In 2014, 14.7 percent of African-Americans, 12.1 percent of American Indians and Alaska Natives, and 9.8 percent of Latinos were unemployed compared to 7.9 percent of Whites (US Census Bureau, 2015). In addition to providing income, the work experience has health consequences. There is a *work status–health gradient* similar to the wealth–health gradient. Workers with lower occupational status have a higher risk of death (Rogers, et al., 2000), increased blood pressure (Colhoun, et al., 1998), and more heart attacks (Möller, et al., 2005, Burgard & Lin, 2013). Higher status workers often have a greater sense of autonomy, control over their work, and predictability, compared to lower status workers, whose lack of control and predictability translates to stress that shortens their lives (Marmot, et al., 1978). Nonstandard working arrangements such as part-time, seasonal, shift, contract, or informal sector work have been linked to greater psychological distress and poorer physical health (Dooley & Prause, 2004; Virtanen, et al., 2005). Women are heavily overrepresented in nonstandard work, as are people of color and people with low levels of education (Nollen, 1996; Burgard & Lin, 2013).

The implementation of California's climate change goals provides great opportunity to not only improve the habitability of the planet, but also to increase economic vitality, employ historically-disadvantaged people in secure jobs, and improve the health of the population. Measures in the 2030 Target Scoping Plan that aim to reduce greenhouse gases can simultaneously improve health and social equity by prioritizing or requiring that: 1) infrastructure projects using public funds pay living wages, provide quality benefits to all employees, and minimize nonstandard work; 2) locals are hired as much as is feasible; 3) preference is given for women-owned and minority-owned businesses; 4) employers receiving public funds assess and reduce work stress and lack of workplace control; 5) projects benefiting from State climate investments prioritize hiring from historically hard-to-employ groups, such as youth (especially youth of color), formerly incarcerated people, and people with physical or mental illness; and 6) training is provided to these same groups to work in jobs in sectors that will support a sustainable economy.

Communications Supporting Climate Change Behaviors and Policies

California's leadership on GHG reduction is exceptional. However, climate mitigation goals are often treated independently by sector, and the public does not see a unified message that changes must take place on every level in every sector to preserve human health and well-being. Climate strategy could be supported by public communications campaigns that link sectors, and present a message of the need for bold action, along with the benefits that action can yield. Mass media communications and social marketing campaigns can help shift social and cultural norms towards sustainable and healthy practices. Messaging about the co-benefits of climate change

policies in improving health and well-being can lead to increased community and decision-maker support among vulnerable groups for policies and measures outlined in the 2030 Target Scoping Plan.

Community Engagement Leads to Robust, Lasting and Effective Climate Policies
In order for California's climate change policies to be supported by the public and be implemented with enthusiasm they must be developed through ample, genuine opportunities for community members to discuss and provide input. Californians contributions to the policy arena strengthen the end products and assist in their implementation and enforcement.

Efforts to mitigate climate change through policy, environmental, and systems change present considerable opportunities to promote sustainable, healthy, resilient, and equitable communities. The measures in the 2030 Target Scoping Plan and how they are implemented can help create living conditions that facilitate physical activity; encourage public transit use; provide access to affordable, fresh, and nutritious foods; protect the natural systems that human health depends on; spur economic development; provide safe, affordable, and energy-efficient housing; enable access to jobs; and increase social cohesion and civic engagement. These climate change mitigation measures can improve overall population health, as well as material conditions, access to opportunity, and health and well-being in communities facing health inequities. Approaching the policy solutions outlined in the 2030 Target Scoping Plan with a health and equity lens can ultimately help lead to a California in which all current and future generations of Californians can benefit and thrive.

1. **Approach – JANUARY DRAFT**

2. **Key Air Quality-Related Public Health Benefits – JANUARY DRAFT**

3. **Existing Programs for Air Quality Improvement in California – JANUARY DRAFT**

4. **Statewide Analysis – JANUARY DRAFT**

D. Disadvantaged Communities – JANUARY DRAFT

E. Summary of Societal Benefits – JANUARY DRAFT

F. California Environmental Quality Act Function Equivalent Document – JANUARY DRAFT

APPENDICES
Table of Contents

APPENDIX D

EJAC Initial Recommendations

AB 32 Environmental Justice Advisory Committee (EJAC)
Initial Recommendations for Discussion Draft Version of 2030 Target Scoping Plan Update
August 26, 2016

Overarching Issues

The AB 32 Environmental Justice Advisory Committee (EJAC) started meetings about the 2030 Target Scoping Plan in December 2015. In addition to committee meetings across the state, the EJAC hosted a robust community engagement process in July of 2016, conducting 9 community meetings and collecting over 700 individual comments. The recommendations below are informed by those meetings, EJAC member expertise and comments received. To help make our recommendations more actionable, we sorted them into five themes that are described in more detail below and throughout this document: partnership with environmental justice communities, equity, economic opportunity, coordination, and long-term vision. While our recommendations are sorted by sector, we intend them to be read and implemented holistically and not independently of each other.

Partnership with Environmental Justice Communities	
1	Encourage public engagement and a culture shift in California to step up the implementation of our state's climate plans, using the following strategies: a. Develop a communications plan to get everyday people excited about our climate programs. The plan must focus on the health and socio-economic impacts of air pollution and climate change, and include innovative, multilingual delivery methods like integration into school curriculum, technology applications, or Public Service Announcements (PSAs) to convey how air pollution and greenhouse gases are related to increases in hospital visits, lost wages, and economic insecurity. b. Promote community-level climate projects to show people how they are done and what they can accomplish. c. Create a "report card" for elected officials that show community members how officials voted on regulatory policies and the implications of those policies. d. Create a "report card" on Scoping Plan implementation that is updated every two years, using metrics identified in the Scoping Plan.
2	Emphasize and demonstrate neighborhood-level solutions that draw on community ideas, rather than just taking a top-down approach. Ensure long-term community engagement and pre-assess projects in the targeted community and conduct at least five-year follow-up to ensure that projects result in community-directed benefits.
3	Continue to convene the EJAC beyond the Scoping Plan process. Implementation of the Scoping Plan can tap on the expertise and relationships of the EJAC members and their networks. Public policy is more successful when there is broad public awareness to ensure its success and oversight.
Equity	
4	ARB must better balance reducing greenhouse gases and reducing costs (cost compliance) with the other AB 32 goals of improving air quality in EJ communities while maximizing benefits for all Californians. There has been too much emphasis on reducing costs to industry, and not enough attention on reducing emissions and their associated costs in EJ communities.
5	Equity must always be a primary consideration when examining issues in any sector. Decades of cumulative impacts and inaction have led to a sense of urgency in needing to resolve adverse health and economic issues in disadvantaged communities. To demonstrate progress and build trust, both short- and long-term activities need to result in positive, immediate, and measurable impacts in these communities. ARB must

Overarching Issues	
	conduct an equity analysis on the Scoping Plan and each sector. Work with EJAC on the analysis and the right questions to ask.
6	All climate goals and policies need to have metrics and baselines quantified to ensure that actions are meeting targets and goals over time. Each sector's data must show historic emissions and future trends (both business as usual and how much reduction if certain programs are implemented). Each emissions sector, must calculate goals for emissions reduction to 2030; see example with the Short Lived Climate Pollutant strategy. These metrics must also include public health outcomes and issues.
7	ARB must develop contingency plans for mitigation and adjustment to the overall plan if emissions increase in benchmark years (due to huge leaks like Aliso Canyon, or if certain programs fail to reduce emissions). Timely emissions data will also allow ARB to adjust or incorporate new strategies as needed.
8	Expand and integrate real-time air quality monitoring, citizen science, and SEPs (supplemental environmental projects) in disadvantaged regions, including the California/Mexico border region. Monitors must be placed throughout regions to ensure we have an accurate understanding of air quality issues in that region. Consider a carbon tax that funds monitor installation and maintenance at every school in California.
Coordination	
9	Achieving our ambitious 2030 targets will require ARB to work with other agencies, jurisdictions, and program processes. Coordinate meetings between the interagency working groups (IWG) and EJAC, to encourage information sharing and mutual cooperation between the groups. Improve coordination among state, federal, and local agencies with regard to their planning and implementation activities. Support cities and local implementation of Energy and Climate Action Plans.
10	Coordinate strategies to prevent and address sprawl with equity at the center. Sprawl has negative environmental impacts on transportation, air, water, and more. New projects must not create adverse impacts like displacement of existing residents. Negative Declarations need to be phased out. All new greenhouse gas sources must be mitigated.
11	All policies and programs must adopt strong, enforceable, evidence-based policies to prevent displacement of existing residents.
Economic Opportunity	
12	Maximize job and economic benefits for Californians. Develop a just transition for workers and communities in and around polluting industries with a pathway for them to be first in line for jobs in the green economy. Include a section in the Scoping Plan on healthy, well-paid jobs and broad economic benefits, especially targeted for EJ communities, for jobs that don't require a worker to sacrifice his or her health in order to support a family, as is currently common. These efforts must emphasize capacity building in the community and outline fair hiring practices and policies, and be first focused on transitioning workers from polluting industries.
13	Benefits from Scoping Plan implementation must be accessible to Environmental Justice communities. Vouchers to help access new technologies, geographic distribution of resources and investments to disadvantaged communities, and transparent/accessible engagement in any planning and decision-making processes are essential.
14	Build in incentives and support for compliance. Incentivize behaviors that protect and improve disadvantaged communities; both on a large scale (e.g., industry and agriculture) and at a community level (e.g., completing communities with paved roads,

Overarching Issues	
	sidewalks, bike/pedestrian paths, and planting trees). Explore effective strategies for change without incentives.
15	Ensure that AB 32 economic reviewers come from various areas around the state to represent insights on economic challenges and opportunities from those regions. The Environmental Justice Advisory Committee must choose at least half of the members. Ensure that the EJAC receives ready and timely notice of and access to any economic reviews, in time to give advice to and guide the process.
Long-Term Vision	
16	The Scoping Plan must not be limited to examining interventions and impacts until 2030, or even 2050. What we do today and for the next 30 years will have impacts for seven generations, so our planning and analysis must have a longer-term scale to prevent short-sighted mistakes and rather reach our long-term vision. We request that all policies and analyses include this long-term vision. a. Leave fossil fuels in the ground b. Do not create new infrastructure that relies on fossil fuels, including natural gas, fracking, pipeline development, crude oil shipments and processing c. Just transitions model of moving toward local living economies that prioritize the well-being of communities
17	The EJAC expects to see the largest proportion of reductions of greenhouse gases take place in California in the future. ARB must prioritize actions and investments in California EJ communities before looking at other Californian communities or outside of California.
18	Achieving our 2030 targets will require more effective implementation and creative innovation than we have ever done before. The Scoping Plan must prioritize whenever possible the innovation of new technologies or strategies to reach even deeper emissions cuts. These innovations must put EJ communities first in line for environmental and economic opportunities.

Industry	
	Equity
1	State in the Scoping Plan that it is a priority to reduce emissions in EJ communities, and to ensure no emissions increases happen there. Through standardized metrics, ensure that emission reductions from AB 32 activities are being achieved, especially in EJ communities.
2	Use a "loading order" for Industry similar to the one that is used by the California Energy Commission for supplying demand. Always prioritize the approval and use of the most efficient and low-carbon technologies, facilities, and projects over high-polluting ones
3	Address localized impacts of short-lived climate pollutant emissions, such as black carbon from all sources.
4	A big design flaw of Cap-and-Trade is having an ambiguous economy-wide cap. Eliminate Cap-and-Trade, replace it with a non-trading option system like a carbon tax or fee and dividend program. In addition: a. Increase enforcement of existing environmental and climate laws, increasing penalties for violations in DACs. b. Establish a state run "Carbon Investment Fund" allowing the private financial sector to invest in Carbon Futures. Pay dividends through enforcement fines, permit fees and carbon tax receipts. c. Better coordinate climate pollution and local criteria pollutants programs. d. Place individual caps on emission sources, rather than using a market-wide cap. Set up a per-facility emissions trigger that will tighten controls when a certain level is reached. e. Establish a moratorium on refinery permits. f. Set goal of 50% emissions reduction in Oil and Gas sectors by 2030. Aggressively reduce emissions from these sectors, including fugitive and methane emissions from extraction and production. g. Put emissions caps on the largest polluters. h. If Cap-and-Trade continues, do not give out more free allowances. i. Do not exempt biomass burning activities. j. Do not allow regulated entities to apply for California Climate Investments funding. k. Increase the floor price to the real price of carbon; use the highest price offered, not the lowest. Incorporate industry's externalized costs into the cost of carbon (as is done with the mitigation grant program at Port of Long Beach). Calculate the cumulative impacts so they can be mitigated. Ensure that polluting facilities are paying the societal costs of their emissions, rather than externalizing them.
5	The Scoping Plan Economic Analysis must consider carbon tax, command and control regulation, and Cap-and-Dividend or Fee-and-Dividend. Cap-and-Trade must be eliminated. The price of carbon must be increased, with the resulting funds invested in local communities to ensure all benefits from a greenhouse gas free future.
6	Expand the definition of *economy* to include costs to the public (e.g., U.S. EPA social cost calculator). Conduct an economic analysis that would account for the cost to public health (beyond cancer, respiratory and cardiovascular diseases) and environmental burdens from greenhouse gases. Include the Integrated Transport and Health Impacts Model (ITHIM) in the analysis. Ensure that ARB coordinates with other state agencies in this effort.
7	Ensure that the Adaptive Management tool is adequate for real-time monitoring and intervention. There must be at least two EJAC members on the Adaptive Management work group. To demonstrate how the tool can help communities, complete an Adaptive

Industry	
	Management analysis for Kern County.
8	To address tension between workers and community members who live in polluted areas, there needs to be access to economic stability and a just transition to the new clean economy. Ensure that workers in Environmental Justice communities whose livelihood is affected from a move to cleaner technologies have access to economic opportunities in that new clean economy and that local businesses continue to employ workers from that community.
9	Do not commit California to continuing Cap-and-Trade through the Clean Power Plan. Since carbon trading cannot be verified, ensure that the Clean Power Plan power purchases are from sustainable, renewable power plants.
10	Eliminate offsets. Actions and investments taken by industry to reduce emissions need to be reinvested in the communities where the emissions have occurred. Any benefits from greenhouse gas reduction measures must affect California first. In addition to California emissions, also consider activities that can reduce pollution coming from across the Mexican border, to reduce emissions in the border region. Do not pursue or include reducing emissions from deforestation and forest degradation (REDD) international offsets in the Scoping Plan.
Coordination	
11	ARB needs to examine ways to increase its partnerships with and oversight over air districts using its existing authority. Local air districts need to be held accountable to the same standards as ARB. Promises need to be documented and strictly enforceable. If an air district chooses to have stronger standards than ARB, that air district must have the power to enforce those stronger standards without interference from ARB.
12	Stop "passing the buck" from agency to agency and fix the problems. All agencies need to take responsibility for all pollutants. Coordinate efforts among agencies when necessary, and among local governments and communities. Implement the following measures: a. Improve community and neighborhood level air pollution monitoring. b. Add EJ members to all agency boards and committees. c. Tier pricing for allowances for facilities in EJ communities, making it more expensive to pollute in those communities. d. Improve communications about air quality between polluters and schools and nearby residents, both for individual accidents and in terms of overall facility emissions. Develop a cooperative, productive discourse. e. Provide easily accessible and immediate notification to schools and nearby residents in the event of a facility accident; current notification is much too slow. Develop and make accessible tools like the real-time air quality advisory network (RAAN) phone application, so residents can access real-time air quality information at the neighborhood level. f. Establish better coordination between enforcement agencies. Expand air quality night enforcement so that all communities have around-the-clock enforcement to address off-hours violations.
Partnership with Environmental Justice Communities	
13	Create a thorough air quality monitoring system and deputize the community to participate in that network through databases, apps, and community science. Fund a program to provide communities with the tools and training they need to participate. Identify the pockets not being monitored and also the hot spots. ARB must take a greater responsibility for monitoring. Ensure that all monitoring covers both greenhouse gas pollutants and criteria

Industry	
	pollutants, to expand the state's databases and accurately characterize all communities, so that CalEnviroScreen can more reliably identify areas that qualify for funding. Make monitoring transparent and accessible.

Energy, Green Buildings, Water	
Equity	
1	Develop aggressive energy goals toward 100% renewable energy by 2030 to reach emissions reduction sooner, especially if other sectors lag or increase emissions. Increase 2020 reduction target to 50%, aiming up to 100% reduction by 2050.
2	California must fully practice the state's energy loading order: prioritize all cost-effective energy efficiency, then demand response, and finally renewables and distributed generation. These priority strategies, in combination with energy storage, must be fully utilized prior to the use of natural gas power plants.
3	Expand rooftop solar in EJ communities, including desert communities. Use brownfields for solar.
4	Remove special considerations or exemptions for investor-owned utilities, and instead require them to develop power that is the most clean and efficient, and under the same rules and structure as their counterparts.
5	Imported electricity must not be considered renewable beyond the percent of renewable energy production (the renewable portfolio) currently existing in the exporting state. There must be no double-counting or incentives to encourage other states to burn fossil fuels.
6	Do not use Cap-and-Trade (or carbon trading, offsets) for the Clean Power Plan. The Clean Power Plan must ensure power is generated from sustainable, renewable sources.
7	Do not provide energy credits for biomass burning or count it as renewable energy. Make wood chips available from dead trees to use as mulch in gardens (don't burn it).
8	Carbon capture and sequestration power plant projects using captured carbon dioxide for enhanced oil recovery must not be certified as projects that sequester carbon for the purpose of carbon credits of any kind. Also, injection of carbon dioxide for sequestration purposes shall not take place without the express permission of all surface landowners above the zone of sequestration in order to qualify for carbon credits.
9	Climate investments and energy solutions (building retrofits, weatherization, solar, microgrids, etc.) must serve entire disadvantaged communities, rather than just individual buildings or homes. Other populations of note include: fixed-income, seniors, people with chronic conditions, and other low-income residents.
10	Develop innovation hubs for disadvantaged communities in order to support innovations, development and use of clean energy and weatherization, like low-cost solar cell stacking.
11	Upgrade residential building electrical systems to support clean energy upgrades in urban, rural and unincorporated communities. Increase progressive types of code for future upgrades. State funds for clean energy technologies in disadvantaged communities must allow for funding for maintenance and upgrades necessary for clean energy technologies. Create green development bank to fund energy efficiency programs in disadvantaged communities.
12	Prevent and mitigate negative land use impacts from energy projects, including increased dust from clearing land, sprawl, displacement, increased traffic, and understanding costs of these emissions projects.

Energy, Green Buildings, Water	
13	Set a moratorium on new oil and gas operations (refineries, power plants, fracking wells, etc.).
14	Phase out natural gas-based appliances and technologies, and transition to electric and solar thermal technologies. Offer energy efficient household appliance upgrades to low-income residents in particular.
15	Support tree planting and green infrastructure in communities to reduce energy use for cooling buildings. Such infrastructure could include cool roofs or permeable surfaces to cool community and reduce energy consumption.
16	Set and enforce greenhouse gas reduction targets for existing buildings and improve building codes. Broaden the definition of a "green building" to include retrofits of existing buildings in disadvantaged communities. Identify and implement best practices for retrofitting existing buildings.
17	Set goals for new and green buildings: all new constructions to be zero net energy (ZNE) by 2020, with none using natural gas or biogas. Include affordable housing buildings in ZNE goals.
18	Develop standards and support the construction of "living buildings" (regenerative buildings that more closely follow natural ecosystems, with features such as solar, water capture, efficient and affordable transportation options, etc.) within disadvantaged communities.
19	Provide direction to industry on best practices for rapidly moving toward widespread design and construction of green buildings within disadvantaged and low-income communities, and incentivize developers to adopt the standards and implement them. Ensure that building or retrofit costs are not passed along to low- and moderate-income tenants by providing tax incentives, or by adopting policies that prevent having those costs passed on to them. Share energy savings with renters.
20	Make pumping of water by the State Water Project in California 100% renewable by 2030, with consumers of the water paying for renewable energy installation and production along the project right-of-ways.
21	If geothermal energy is developed, ensure that it is benefiting, and not harming, the local community.
22	Identify the energy use and reduction goals for the proposed California Water Fix and Eco Restore project (formerly the Bay Delta Conservation Plan), including the pumps at Tracy (the single largest energy user in California).
23	Encourage regional self-sufficiency and conservation to maximize water supply through water recycling and rainwater capture, low-impact development, end-user education, and use of native plants, and by enforcing the proper use of landscape water. Provide resources to help low-income households install grey water designs for landscape irrigation.
24	Prioritize pollution prevention in all AB 32 projects and regulation. The provision and distribution of affordable, safe drinking water for all must be the highest priority. ARB is subject to code enforcement of making water available.
25	Stop investing in dirty energy. Eliminate subsidies and financing for fossil fuels and in technologies such as corn-based biofuels, agricultural methane, biomass burning, waste-to-energy, or other unsustainable technologies that result in negative impacts on EJ communities. Use funds instead for clean energy projects in EJ communities.
Coordination	
26	The California Energy Commission (CEC) must evaluate all renewable energy projects under the renewable portfolio standard (RPS) for lifecycle emissions and co-pollutants to ensure they do not create new problems in overburdened communities. The CEC must render

Energy, Green Buildings, Water	
	ineligible those technologies that increase local air quality burdens without direct and current 200% mitigation of all air quality impacts within ten miles of the project location. The CEC must ensure that imported renewable energy, including that from tribal lands, is consistent with California requirements.
27	Prioritize the siting of renewable energy, grid storage, microgrids, and community choice aggregation projects within communities identified by CalEnviroScreen. EJ communities need to be able to reap the environmental and economic benefits of these energy projects. Pilot 10–100 microgrid projects in EJ communities. The California Energy Commission must prioritize and maximize clean energy research and development investments in disadvantaged communities through its Electric Program Investment Charge (EPIC) Program and actively engage those communities in developing the investment plan for that work. Ensure that power companies do not disincentivize neighborhood-level renewable energy generation through taxes and feeds.
28	Avoid and mitigate any increased emissions from energy operations, and prioritize disadvantaged communities in this effort. The California Independent System Operator ("CAISO") must not pursue regionalizing the energy market if there are negative impacts like natural gas plant emissions increases or health effects on disadvantaged communities. Ensure an effective and aggressive adaptive management plan if there is grid regionalization. Prevent negative unintended consequences with strong inter-agency coordination between the Air Resources Board, California Public Utilities Commission (CPUC), California Energy Commission (CEC), CAISO, and local air districts, and in related proceedings and policy discussions.
29	The California Energy Commission (CEC) must provide guidance to state and municipal energy agencies to lower the barriers to pursuing deep energy retrofits to upgrade homes, businesses, and public institutions in low- to moderate-income communities. This can happen through the CEC's SB 350 Barrier Studies and any related follow-up studies.
30	Mandate local jurisdictions to install energy-efficient alternatives in community buildings (e.g., shopping malls, recreation centers) as they do in government buildings.
31	Coordinate federal, state, and local agencies to create a one-stop shop for residential, commercial, and industrial energy efficiency and renovation programs. Focus on the whole house rather than on one aspect at a time, so that multiple programs can be more easily accessed, and on retrofitting the whole community to leverage economies of scale. Make homes more energy efficient before installing renewables. Establish pilot projects to retrofit substandard low-income housing with federal Housing and Urban Development (HUD) funding.
32	Implementing agencies must build training partnerships with local institutions that have a proven track record of placing disadvantaged workers in career-track jobs (such as community colleges, nonprofit organizations, labor management partnerships, state-certified apprenticeship programs, and high school career technical academies).
Partnership with Environmental Justice Communities	
33	Increase literacy about clean energy programs and services, especially for people in geographically, linguistically, and/or economically isolated communities. Use trusted sources of information such as community-based organizations, school curricula, outreach to immigrant communities in-language and employ culturally appropriate and multigenerational messaging techniques.
34	Identify, implement, and standardize metrics to track energy savings, quantify energy reductions, conduct post-project assessments to ensure accountability, and survey local

Energy, Green Buildings, Water	
	activities to determine if strategies are working (or not). Use EJ residents as a resource for data collection.
35	Promote more education to water end-users about ways to conserve water and energy.
Economic Opportunity	
36	Promote the development of community-driven clean energy projects that hire from disadvantaged communities, prioritize community ownership of (and equitable access to) clean energy technologies, maximize energy bill reductions for low- and moderate-income communities within disadvantaged communities, and prioritize anti-displacement strategies. For climate projects, employ project labor agreements, best-value contracting and local/targeted hire goals to provide access to career-track construction jobs for disadvantaged workers. In consultation with state workforce agencies, direct implementing agencies of climate programs to develop specific goals to train and facilitate employment of workers from disadvantaged communities. Use CalEnviroScreen, other robust screening tools, and local unemployment data to identify and prioritize communities for job creation programs.
37	ARB shall work with appropriate state agencies to identify and develop data and criteria for measuring economic and employment co-benefits resulting from AB 32-related public investments. Develop measurable targets and a process for determining if those targets are met. To improve transparency, report progress or lack of progress to the community regularly. Provide better oversight of climate change investments to ensure they benefit all EJ community members.
38	Maximize carbon reduction and energy savings by directing implementing agencies to promote the highest quality work, standards for participating contractors, and minimum training and skills for workers.
39	Provide scholarships for college work in relevant clean energy fields.
40	Develop incentives, rebates, and financing mechanisms to accelerate equitable access to clean energy technologies in low-income households, apartment buildings, small businesses, and other community-serving facilities such as community centers, churches, health clinics, schools, parking lots, local industry buildings, and community-based organizations. Surplus energy can be invested back into the community or to cleanly fuel industrial facilities. Eliminate landlord signature for energy improvements or rebate application programs; obtaining a signature can be difficult and landlords sometimes increase rent after upgrades.
41	Develop incentives and phase in requirements for renters and landlords to provide energy efficiency upgrades and provide upgrades that enable buildings to use renewable energy technologies and water capture. Update building and zoning codes to support renewables. Enable builders to fast-track a project if it includes solar. Follow U.S. Department of Housing and Urban Development (HUD) program guidelines so landlords cannot raise rents due to improvements.
42	Lower finance barriers and increase access to low- and no-interest energy efficiency financing for the low- to moderate-income single-family, multifamily, and small business sectors. This includes credit enhancements, interest rate buy downs, rebates, low-interest loans, and supporting the use of alternative measures of creditworthiness to provide greater access to affordable capital.
43	If federal tax credits for residential solar installations are discontinued in the future, California must make up the difference with state tax credits and rebates.
44	If federal tax credits for small business solar installations are discontinued in the future, California must make up the difference with state tax credits and rebates.

Energy, Green Buildings, Water	
45	Protect low-income households from energy price spikes.

Transportation	
Overarching Principles	
We envision a California where all communities breathe clean air and have access to safe, affordable, clean transportation options. The following recommendations will help to achieve this vision. The themes present in this Transportation Section that can be lifted up as overarching principles are: a. Access to clean transportation technologies b. Meaningful investments in disadvantaged communities c. Capturing economic benefits in disadvantaged communities d. Coordination of state and local agencies e. Reporting on actual impacts of programs, particularly community level impacts f. Robust community participation	
Equity	
1	The top priority for transportation planning and investments is to reduce vehicle miles traveled (VMTs) while increasing access to affordable, reliable, clean, and safe mobility options in disadvantaged communities.
2	Examine mobility regionally, as there are different challenges and opportunities in different areas of California. For example, reduce transportation emissions along the border with Mexico by focusing on cross-border commuting. Reduce the long border wait lines and idling by increasing lanes for walking and biking, providing zero-emission bus and shuttle options, and increasing transportation infrastructure to support traffic.
3	Expand transit services to provide neighborhood-level access, use different vehicle sizes and types to ensure economies of scale, sustainability, and accessibility to disadvantaged communities. Increase access to buses and trains for youth, students, elderly, those seeking medical care, and low-income riders. Employ free or discounted transit passes for these groups. Prioritize funding for buses in areas where buses are relied upon more by low- and moderate-income commuters in disadvantaged communities.
4	Define *infrastructure* not just to include highways, freeways, new fueling stations, and roads, but also sidewalks, bike paths, and green infrastructure. Invest in multi-modal and shared transportation instead of building new freeways. Furthermore, state and local government agencies must not count building freeways as a GHG reduction strategy.
5	Ensure that there is sufficient infrastructure to support new and current low emission vehicle types (i.e. bikes, electric vehicles, etc.). The state must strengthen and identify more opportunities to fund and mandate local land use decisions that support a low-carbon future and protect the health of local residents.
6	Promote more community-friendly land use planning that prioritizes the health and economic wellbeing of environmental justice communities and is developed in close consultation with community members. We recommend the following community-friendly land use planning strategies: a. Design and implement new incentives, beyond tax credits, to encourage infill and mixed-use development over sprawl. Develop and implement land use, building code, and permitting changes to streamline planning. b. Increase support for use of cleaner, safer sidewalks and bike paths. Better lighting,

Transportation	
	increased distance or barriers from roadways and freight railways. increase bike and path/sidewalk sweeping c. Ensure that the placement of bus garages, terminals, and hubs does not disproportionately impact environmental justice communities and pursue measures to reduce environmental impacts from these facilities. d. Promote and fund projects that create clean, safe, and accessible mobility pathways and networks for environmental justice community members, particularly more sensitive populations such as youth, elderly, and those with health problems. Mobility options must include more active transportation options such as bike paths and sidewalks. e. Improve existing transit resources, including increasing the number of bus stops where needed, developing intelligent and connected bus stops, and improving bus stop infrastructure (e.g., covered and better lit bus stops with more benches). Transit planning and maintenance must prioritize safety and coordinate with last mile initiatives. Transit planning must also prioritize efficiency and support routes that promote accessibility, reduce health impacts from criteria pollutants, and lower GHGs. f. Plan for dedicated bus lanes on the freeway to promote the efficiency and use of public transportation. The buses themselves must be cleaned more frequently and must integrate more easily with other mobility options such as biking and trains/trolleys to help increase user satisfaction and ridership.
7	Target truck fleets and vehicle fleets with electrification and cleaner, sustainable fuels to achieve the quickest, most significant reductions in emissions. The state must increase the fleet turnover target to at least 40%.
8	Actively support and implement California Cleaner Freight Coalition's recommendations to California's Sustainable Freight Action Plan.
9	Develop strategies that ensure small independent trucking companies and concerns are incentivized to transition to zero or near-zero emission vehicles as well as more efficient truck technologies.
10	Restrict truck routes and travel times and limit new trucking operations to reduce vehicle miles traveled to reduce their operational impacts in disadvantaged communities. Increase monitoring and enforcement of these requirements.
11	Support sufficient charging and refueling stations along freight corridors.
12	Increase the required reduction of carbon intensity of fuels under the Low Carbon Fuel Standard from the current 10% to 30% by 2030.
13	Eliminate the assumption in the Low Carbon Fuel Standard Life Cycle Analysis (LCFSLCA) that methane is a necessary by-product of dairies. This will eliminate the awarding of avoided methane emissions credits to dairies. Instead, methane emissions must count as an emissions debit against the fuel. Conduct a new LCFSLCA using standard methodologies applied to all organic and artificial chemical energy sources.
14	Promote clean and renewable energy sources to power vehicles. Plan electric vehicle programs and electricity supply together. Increase coordination among energy and transportation agencies to help ensure the success of supporting initiatives.
15	Study the emissions reduction benefits from increasing gasoline prices.
16	In support of state electric vehicle goals, such as SB 1275, the state must develop and provide funding for a program that ensures deep penetration of electric vehicle use and charging capacity in disadvantaged communities. This must include a pilot program that

Transportation	
	does the following: a. Funds demonstration program placing new and used electric vehicles, along with associated charging and maintenance infrastructure, in at least seven low-income and disadvantaged communities at the residential level, to evaluate best practices and accelerate their integration in these communities statewide b. Ensures a proper diversity of population density: urban, suburban, and rural areas c. Prioritizes areas with aging infrastructure d. Focuses on expanding access to electric vehicle use in schools in disadvantaged communities
17	Accelerate ownership and access to zero-emission vehicle technologies, through the following strategies: a. Universal application and point-of-sale rebates or vouchers for new and used electric vehicle and other clean energy programs in place by June 2017 b. Rebates for used electric vehicles available (outside of Enhanced Fleet Modernization Program (EFMP) and Plus-up project) by June 2017 c. A minimum of 20% of non-luxury multi-unit dwellings have electric vehicle charging stations (or stubs) by 2020 d. A minimum of 25% of state investments in electric vehicle charging station infrastructure occurs within disadvantaged communities e. ARB's "Electric Vehicle Car sharing Program" funds at least 50 projects by 2020 f. Employment and Education Shuttle rebates to fund at least 20 ZEV or hybrid vanpooling and carpooling (including support for charging infrastructure) projects that support community-serving workforce training programs and employment by 2020 g. At least 20 "last-mile" free electric shuttle/bus programs providing transportation to community-serving facilities (e.g., clinics, community colleges, community centers, hospitals, government facilities, job centers, shopping centers) in place by 2020. There must be a regionalized effort to promote integrated solutions connecting community members from public transit to their destination. h. All school districts in disadvantaged communities have electric school bus fleets by 2020. i. Provide incentives to small-businesses (particularly those heavily reliant upon goods movement) for the purchase or use of zero-emission medium- and heavy-duty vehicles. j. Support and finance zero-emission truck and bus initiatives outlined in SB 1204.
18	Ensure that clean transportation infrastructure and mobility options are available in rural, indigenous, and small communities. Specifically: a. Fund and support clean transportation options for low-density communities with less cars and transportation resources. Vanpooling, community-driven ride-sharing (i.e., Green Raiteros in Huron, California), more frequent buses, and bus routes are examples of more mobility options that are more targeted for rural and small communities. b. Target clean mobility incentives to farmworkers who may not have vehicles or need smog tests for polluting vehicles.

Transportation	
19	Improve access to transportation options (active transport, mass transit, ride-sharing) through the following recommendations: a. Promote more effective outreach and information sharing about zero-emission vehicles and other clean mobility options, as well as information about daily air quality conditions. 1. Work with the car industry and ethnic ad agencies on advertising and more targeted campaigning in multiple languages. 2. Get information out through a cell phone application that is free and available in multiple languages. 3. Work with community-based organizations to ensure that this information is available to community members who do not have access to a smart phone. b. Promote and fund community-driven, community-owned, affordable and accessible ZEV shared mobility options in environmental justice communities.
20	All SCSs and transportation project analyses, policies, and investments must include metrics around displacement and gentrification. Non-displacement of residents must be met as part of the permitting process and before awarding funds, and methods for enforcement must be identified.
21	California must promote a culture shift to more efficient and clean mobility options such as mass transit and active transportation. Streamline and promote widespread access to clean mobility options using the following recommendations: a. Promote and incentivize telecommuting as a way to reduce vehicle miles travelled, particularly for communities that have been displaced from areas closer to their work. b. Decrease vehicles idling by working with appropriate stakeholders to retime traffic lights, develop adaptive traffic management systems using real-time data, promote the use of signage or other efforts to reduce idling at drive-throughs and other businesses. c. Partner with businesses and provide outreach, education, and incentives to encourage truck drivers and companies to reduce emissions, reduce idling, and promote more a more efficient use of medium- and heavy-duty vehicles. d. Encourage more ride-sharing by employers.
22	The state must support research on the following topics: a. Growth regional growth projections with an assessment of clean mobility needs in the future. b. Updated and more targeted, scaled down science on the cumulative impacts of pollutants within environmental justice communities. c. Unintended consequences from clean transportation policies and investments on low-income individuals and environmental justice communities (e.g. displacement, impacts on vehicle miles traveled). d. Impacts of road use fees to generate revenue and discourage driving.
Partnership with Environmental Justice Communities	
23	Through robust community participation, ground-truth the actual impacts of program planning and implementation. Strategies include the following: a. Conduct and prioritize community needs, network analysis, and mobility assessments. Transportation agencies and planning groups must be mandated to address mobility gaps in EJ communities and for seniors, low-income populations,

Transportation	
	and people with disabilities. b. Conduct equity analyses when evaluating and implementing transportation options to prevent adverse secondary effects in disadvantaged communities (e.g., the Los Angeles FasTrak program which resulted in more vehicles on artery streets, creating even worse air quality problems for those communities) c. Conduct equity analyses in transportation projects to ensure that investments go to those most impacted by pollution and economic disparities d. Benchmark and track where projects are implemented to measure the emission reduction progress and economic return in disadvantaged communities e. Measure emissions reductions by per capita VMT
Coordination	
24	ARB must work with the California Energy Commission through its EPIC and ARFVTP funding sources must support the advancement of clean transportation innovations within environmental justice communities and must engage community-based organizations in investment plan development.
25	Sustainable Community Strategies (SCSs) must be improved in the following ways: a. SCS compliance with ARB greenhouse gas reduction targets must only be based on documented land use and transportation changes. b. ARB setting strong target for all Metropolitan Planning Organizations. Eliminate the "5 and 10" default for Regional Transportation Plans (RTPs). c. Metropolitan Planning Organizations must only be allowed to authorize implementation of projects that are included in the most recent SCS. d. Transit agencies must be required to adhere to projected routes and costs in the adopted SCS unless alternatives demonstrate increased emission reductions while maintaining or improving access to alternative transportation choices. e. Implementation of SCSs must prioritize investments in disadvantaged communities. f. ARB must consider California Transportation Plan 2040 and Regional Transportation Plan Update guidelines (see also section on improving coordination).
26	Strengthen oversight by state of local government activities. ARB must provide detailed guidance on local zoning to carry out climate and air quality priorities. Furthermore, state agencies need to give local transit authorities more direction about anti-discriminatory Title VI expectations, to promote more equitable funding of transit options, especially regarding fare increases and route changes that may limit access to transit.
27	Financially support transit operations and restoration of transit service and routes and expansion of services where lacking in disadvantaged communities.
28	Establish better interagency coordination among state, federal, and local agencies when planning projects and awarding funding. The following outline specific opportunities for improving coordination: a. Coordination must be transparent and actively seek community and stakeholder input. b. ARB must consider the California Transportation Plan 2040 and Regional Plan Update guidelines in developing and implementing its own planning documents, including the Scoping Plan. c. ARB must improve coordination with California Environmental Protection Agency (CalEPA) and the United States Environmental Protection Agency (U.S. EPA) to

Transportation	
	promote better scientific research on pollution impacts within environmental justice communities and pursue initiatives to prevent harmful cumulative impacts. d. ARB, California Public Utilities Commission, and California Energy Commission must better coordinate electricity planning and the planning of program supporting electric vehicle use to help maximize the use of renewable electricity for transportation, to ensure infrastructure needs are met for electric vehicles, and to better understand opportunities for renewable integration efforts. e. CalTrans and local governments must prioritize greenhouse gas reduction and public health and safety in funding activities and policies.
Economic Opportunity	
29	Prioritize the advancement of economic benefits such as job and workforce training opportunities in disadvantaged communities. Build skills and capacities locally, so infrastructure can be maintained and further advanced.
30	Technical Assistance and Marketing, Education, and Outreach (ME&O) – The state must dedicate funds toward helping less-resourced communities and small businesses take advantage of clean transportation investment opportunities. It is important to develop community-specific technical assistance and ME&O plans to maximize efficacy of outreach efforts.
31	Job Placement and Training – The state must dedicate resources for community-based organizations that support clean energy career pathways for disadvantaged community members. These pathways must include but not be limited to: job placement, apprenticeship opportunities, and building skills that are transferable to a broad set of clean energy jobs.
32	Ownership and Access – The state must support the increased access to and ownership of clean energy and clean transportation technologies and mobility options in disadvantaged communities (discussed in more detail above).

Natural and Working Lands, Agriculture, Waste	
Coordination	
1	ARB and other state agencies (including the California Public Utilities Commission, California Energy Commission, Office of Environmental Health Hazard Assessment, Department of Toxic Substances Control, and CalRecycle) must undertake a process to examine the growing evidence that biomass and biogenic carbon have real and significant climate impacts, examine the long-distance transport contribution to overall greenhouse gas impacts of burning biomass material, and examine assumptions of health and environmental impacts from burning various materials considered to be biomass, including the impacts of biomass ash. Ash from burning biomass, urban wood waste, and other materials has been found to be dumped on California agricultural land in recent years, and this ash has been found to be contaminated with dioxin and other health-threatening chemicals. Before pursuing increased burning of biomass in California, ARB, the Natural Resources Agency, and related agencies must investigate where ash from the existing burning of biomass is ultimately being dumped, the environmental justice impacts and impact on agriculture, and the cost of biomass ash handling in California. This is of growing importance as new EPA regulations allow for the increased burning of waste and biomass at industrial facilities (i.e. industrial boilers, cement kilns), and as material deemed to be biomass are exempt from compliance obligations under California's Cap and Trade program.
2	Establish better coordination between ARB, Caltrans, the California Energy Commission, CalRecycle, the Department of Toxic Substances Control, and other agencies whose purview include Natural Lands, Agriculture, and Waste-related emissions. Together, these agencies must be available for consultation with EJAC to support plan and policy development.
Equity	
3	Data Collection – timely and comprehensive data collection is essential to avoiding negative impacts and ensuring co-benefits. Such data must include: a. emissions from forestry and wood products, since forest management is a net source of greenhouse gases. b. wildlife habitat (including agricultural land) to facilitate conservation and link to the greenbelt. c. metrics to quantify the greenhouse gas benefits of managing natural and working lands. Achieve consensus on how to measure greenhouse gas emissions reductions from activities in natural systems. Discuss and agree upon these metrics with the interagency working group and community stakeholders.
4	No credits must be given for landfill or for biodigestors for greenhouse gas avoidance. The state's biomass garbage and all other incinerators, including but not limited to gasification, will be treated like other carbon-intensive industries and pay for all carbon emissions under California's Cap and Trade program. At a bare minimum, the state must align with the requirements of the EPA's Clean Power Plan (CPP) on this point. The CPP clearly recognizes that carbon dioxide emissions from burning the fossil fuel-based portion of garbage (i.e., plastics) must be counted. CPP also acknowledges that incineration undermines waste prevention programs, which have significant climate benefits. Beyond this minimum accounting requirement, the state already recognizes the benefits of using compost (from food, paper, wood, yard waste, and other natural materials in the waste stream) to store carbon in the soil. Thus, the carbon dioxide emissions of burning such materials must also be counted in the state's Cap and Trade program. Additionally, the state must revoke all existing incinerator carbon credits. Disincentivize and discourage locating biomass and

	digesters in disadvantaged communities or in close proximity to housing.
5	Healthy Soils – a critical element to land and waste management is soil regeneration. Strategies include: a. Implement climate action plan goals for urban agriculture and community gardens with integrated composting strategies. b. Research and market development for creation, storage, and application of compost for environmental health protection and carbon sequestration, the composting of woody materials together with manure, and agricultural land application of mulch from excess woody materials. c. Promote urban hydroponics and aquaponics. d. Ban agricultural burning of waste; Provide a baseline credit for applying carbon back to soils. e. Promote composting by providing education and assistance to implement composting in all communities. Support the expansion of infrastructure for composting where necessary, and map out the mechanisms for composting in each community. Share best practices between municipalities to ensure all residents have access to programs. Incentivize neighborhoods to compost food waste from schools and at the community level. Establish communication plans that show Californians how to compost and motivate people. f. Promote biologically intensive (regenerative organic) agriculture for the variety of agricultural, environmental, and economic benefits it provides, and to rebuild soil g. Stop overgrazing h. Do not strip forest waste from the mountains to feed biomass plants; instead, sequester the carbon on site through chipping and burying. i. Manage forests to maintain a solid canopy and replant open areas immediately. j. Build clean air, water, and healthy soil consciousness aggressively. k. Mandate that all communities balance natural and working lands to sequester carbon and uptake pollution to replenish natural systems. l. Develop a simple metric for soil carbon or soil organic matter (SOM), to set up a meaningful reward system for carbon farmers who meet an obvious threshold of SOM or carbon sequestration.
6	Waste diversion – a. Establish waste diversion programs like “pay as you throw,” where people pay per pick up amount b. To minimize emissions from waste and recycling trucks fleets, establish more efficient routes and use cleaner fuels. c. Enforce the mandate that commercial buildings have recycling programs d. Set composting as the primary goal for incentivizing waste diversion. Waste needs to be composted and recycled as close as possible to its point of origin and/or collection. Communities must take full ownership of their waste and not export it to disadvantaged communities, and must recognize that impacts stem from not only the waste, but also the use of diesel trucks to carry the waste away. Encourage the use of waste as a resource and support infrastructure investments that maximize recycling and composting programs. Ensure that environmental justice communities do not become the repositories of this excess waste. Finished compost can be exported where it’s needed to support forestry and agriculture focused carbon sequestration goals e. Divert dairy waste as fertilizer and for carbon sequestration before it can be converted to methane.

7	Waste from "renewable resources" like geothermal need to be evaluated, managed, and waste and other externalities must be considered, in the determination of renewable energy sources. Do not use or provide financial support or investment to gasification and biofuels as qualifying renewable options.
8	Develop more local agricultural processing centers so food is not being trucked long distances. Introduce a scoring system for food that indicates food-miles traveled. Encourage local food processing of food and meat, and educate people on the greenhouse gas reduction benefits of not eating meat. Establish public financing for healthy, environmentally sound food sources.
9	Restrict sprawl— a. use productive lands for production. Do not use usable agricultural lands for solar and wind farm projects. Such projects produce only a few, short-term jobs and the electricity is sent to large population centers, which results in farmworker displacement and a net job loss. Recognize that with new agricultural technologies, lands seen as "marginal" are greatly reduced. If solar or wind farms are created, provide job training locally for long-term, well-paying jobs operating and maintaining those technologies. b. encourage less driving. c. Support lifecycle analyses of sprawling developments to determine long-term economic and societal costs versus infill projects, to identify actual costs. d. Support local training, education, and incentives for architects, planners, engineers, and developers to design and develop infill building projects rather than sprawling developments. Provide incentives such as guarantees for a more streamlined planning and approval processes for infill projects. e. Protect greenspace and expand it in disadvantaged communities, insure equity though better enforcement of SB375/SCSs. f. Identify, develop, and implement policy tools to prevent the current trend of gentrification and displacement of local residents, businesses and people of color, pushing residents and people of color out of their communities. Do not provide greenhouse gas reduction funds for improvement projects that will displace current local residents, businesses, and nonprofits.
10	Encourage watershed inventory and awareness. We need better infrastructure and drainage in low-income communities to eliminate pooling polluted water on neighborhood streets and property; and that addresses the high pollution levels that lead to asthma and other illnesses.
11	Integrate urban forestry within local communities. Revise the goal of increasing tree canopy by 5% by 2030 to 20%–30% by 2030. Conduct research to identify methods of achieving that increase given drought conditions. Include urban tree and greenspace maintenance, not just planting/creation.
12	Build biomass, do not burn biomass. Instead of incinerating biomass from trees and municipal solid waste, which puts more carbon dioxide into air immediately, we recommend ARB expand its work to identify and support methods for returning that carbon to the soil, such as composting biomass together with manure. Investigate the growing evidence of carbon sequestration benefits from applying compost to grasslands (resources include the Marin Carbon Project and UC Berkeley Dept. of Environmental Science researchers). Additional benefits of such measures are the reduction of methane and nitrogen oxides, reduced synthetic fertilizer imports, and reduced water use.
13	Identify and establish effective methods for implementing food rescue programs, with quality controls to avoid dumping inedible food on communities. Identify strategies for

	getting edible food to those who need it. Incentivize these programs and promote communication plans for projects, so all communities have access to successful plans.
14	Push innovation on measuring waste and learning how to conduct activities. Overcome infrastructure barriers in dealing with waste.
15	Perform a complete lifecycle analysis of dairy and other bio-digester technology and related infrastructure investment. If biogas from dairies is converted to bio-methane, ARB must mandate that vehicles servicing digesters and converters utilize that gas as a primary fuel source. This is a better use of the fuel than building new pipelines and related infrastructure to transport the gas to other locations.
16	Expand the definition of "urban forestry" to include "rural desert urban forestry," "rural/urban interfaces," and "rural desert communities," so those areas can qualify for funds to support tree planting.
17	Support community land trusts to address gentrification and preserve affordability and access
18	Research and identify alternatives for dumping biosolids (sewage sludge) in disadvantaged communities. Pilot a program to explore and demonstrate better options.
Economic Opportunity	
19	Quantify potential local jobs created from regenerating forests, both urban and rural. Include jobs for maintenance of all green environments, and increase funding to support local workforce development in support of this industry. Fund green infrastructure technician training and tree care maintenance jobs for green space.
Partnership with Environmental Justice Communities	
20	In consultation with all stakeholders including tribal councils and local communities, design and implement healthy forest management strategies that ensure sustainability of the existing forest canopy and decrease extreme wildfire events.
21	ARB must implement a public outreach and education campaign on the climate and co-benefits of urban agra-forestry, as well as the myriad benefits of urban greening in creating livable, healthy communities.
22	Continue to work with local communities and other stakeholders to refine metrics and tools that better quantify the greenhouse gas benefits and co-benefits of managing natural and working lands, including urban green spaces and trees. Achieve consensus on how to measure greenhouse gas emissions reductions from activities in natural systems.

California Climate Investments	
Long-Term Vision	
1	Emphasize regulations that force the advancement of clean technologies. Ensure that near-term technologies do not adversely impact communities and long-term investments moves towards zero emissions.
Equity	
2	Greenhouse Gas Reduction Fund projects must be transformative for disadvantaged communities, in ways defined by each community themselves. California climate investments must take a place-based, regional approach focused on the unique needs of the people of each region, and prioritize projects that boost regional capabilities and economies. The state must support the ability of communities to use technology to communicate progress to the state. These projects must never result in displacement.
3	Within SB 535, further prioritize attention and funding for disadvantaged communities that experience increased greenhouse gas emissions despite implementation of AB 32 programs.
4	Create a formula for funding allocations that ensures investments are equally distributed across DACs in California.
5	To ensure adequate and continued funding of programs, EJ communities must have access to additional funding beyond Cap-and-Trade and the Greenhouse Gas Reduction Fund.
6	No funding must be given to fossil fuel-based industries or any regulated entities under AB 32.
7	Increase accountability of all grantees with regard to reductions claimed for their Greenhouse Gas Reduction Fund (GGRF) funded activities. Provide tools and training so communities can monitor progress based on data.
Economic Opportunity	
8	Spend Greenhouse Gas Reduction Funds (GGRFs) to incentivize local economic development so people can get well-paying local jobs closer to their homes and avoid displacement. Also incentivize local contracting to substantially involved community-based organizations so communities can build capacity at the local level. Community-based organizations must be required to demonstrate community support before receiving funds. Create a system that allows nonprofit organizations to earn points or access to the funds for providing improvements in Environmental Justice communities. For example, larger projects could include nonprofits as part of their proposals, or nonprofits could tap into Cap-and-Trade funds to help supplement their grants.
Partnership with Environmental Justice Communities	
9	The EJAC must help with outreach, accountability, and helping agencies prioritize investments. We must also inform the funding guidelines and investment plan.
10	The Greenhouse Gas Reduction Fund (GGRF) program staff representatives must attend EJAC meetings to provide information and gather input from EJAC members. ARB climate investment staff must identify ways to provide information to EJAC communities and gather community feedback in response. Insure community outreach and engagement is empowered to hold agencies accountable to help them prioritize activities and continually inform guidelines as they relate to ay investment plan.
11	Innovation must come from both the communities involved and ARB. ARB must support K–12 and local college educational programs that educate students about climate change and teach them how to use tools to address it (e.g., students wearing technology that shows the air quality). ARB must work with schools and local colleges to support environmental

	literacy and sponsor multigenerational understanding of climate change and its impacts on the larger community. Funds gathered through polluter violation fees must be used to pay for educational programs in the affected communities.