

# CALIFORNIA'S DECARBONIZATION STRATEGY: ADAPTABLE POLICY WITH STRONG TARGET SETTING AND STAKEHOLDER ENGAGEMENT

**JEFF KESSLER**

California Air Resources Board

**RAJINDER SAHOTA**

California Air Resources Board

*The case-study references several existing public documents that are available online at [www.arb.ca.gov](http://www.arb.ca.gov).*

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## OVERVIEW

California's successful climate policies are set against a background of strong political and public support for protecting the environment, long-term planning, analytical evaluations and modeling, and an inclusive stakeholder process that helps shape long-term plans and individual climate policies. This case study describes California's process for addressing climate change, with a view toward the role of long-term planning in achieving near-, mid-, and long-term targets. It outlines the role of different state actors, as well as the policy and planning process employed by the state. The case study draws lessons learned from this process, highlighting the state's challenges and successes.

California's long-term climate planning process, known as the scoping plan, was first established by law in 2006 when the California legislature adopted landmark greenhouse gas (GHG) emissions reduction legislation in the form of Assembly Bill 32 (AB 32, see Box 1). The governor at the time, Arnold Schwarzenegger (R), signed the bill into law, and for the first time California was required to develop a scoping plan to help establish a path for how the state could reduce GHG emissions to 1990 levels by 2020.

The original scoping plan, which was first approved in 2008, identified a suite of complementary policies, including a cap-and-trade program, that would help California achieve the 2020 GHG emissions reduction target mandated by its AB 32, which also required that the scoping plan be updated at least once every five years.

The second scoping plan, approved in 2013, highlighted the importance of reducing short-lived climate pollutants, such as methane, and encouraged the adoption of a midterm 2030 GHG emissions reductions target. Legally binding 2030 GHG emissions reductions and long-term (2050) emissions reductions

## Box 1: California Climate Politics

*Even though AB 32 passed and was signed into law, the oil industry and other industry groups introduced in 2010 the ballot initiative Proposition 23, which would have suspended AB 32 until unemployment rates fell to 5.5 percent or lower for four consecutive quarters. In a demonstration of Californians' long-held desire to protect the environment, Proposition 23 was rejected by over 60 percent of voters.*

goals were not directly established by AB 32. The scoping plan, however, identified the need to establish midterm targets, and this ultimately led to additional legislation (Senate Bill 32) to establish an emissions reductions target of 40 percent below 1990 levels by 2030.

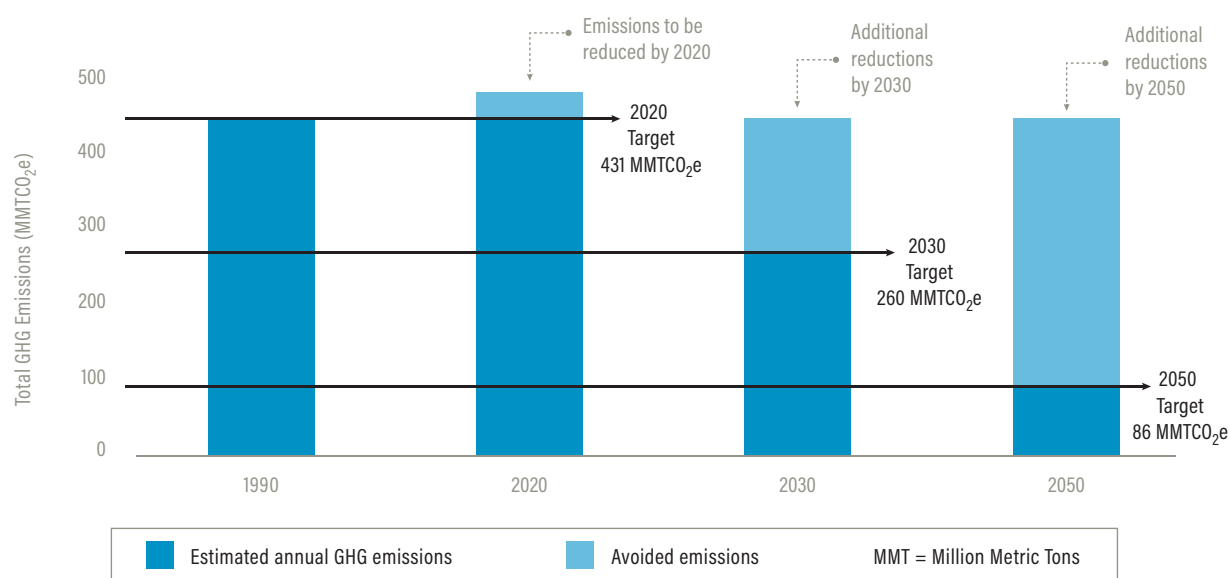
As part of establishing a 2030 midterm target, SB 32 mandated an update to the scoping plan ahead of the five-year requirement. The 2017 scoping plan identified the policies necessary to achieve California's 2030 midterm targets, while also helping put the state on the path toward achieving its 2050 climate target to reduce GHG emissions by at least 80

percent below 1990 levels (Figure 1). Most important, the 2017 scoping plan built on the existing complementary policies and demonstrated why continuing the cap-and-trade program is the most cost-effective path to achieve the 2030 target.

As California looks to further decarbonize the economy, the scoping plan process is expected to guide and inform the diverse mix of policies currently in place and to help determine future developments that will be needed for deeper decarbonization.

Through a well-formulated public stakeholder process and discussions with numerous California state and local agencies, California has been able to adopt some of the most ambitious

**Figure 1. California's emissions reduction targets**



Source: CARB (2019c).

**Figure 2. California's climate policy portfolio**



Source: CARB (2017).

climate policies in the world, while regularly using the scoping plan process to inform new laws and regulations. The scoping plan provides a blueprint to help California achieve some of its most important environmental and sociopolitical goals:

- ◆ Lower GHG emissions to align with a global trajectory to avoid the worst impacts of climate change while minimizing impacts on the economic well-being of Californians.
- ◆ Support a clean energy economy that provides more opportunities for all Californians.
- ◆ Provide a more equitable future with good jobs and less pollution for all communities.
- ◆ Improve the health of all Californians by reducing air and water pollution and making it easier to bike and walk.
- ◆ Become an even better place to live, work, and play by improving our natural and working lands.

## THE CALIFORNIA CONTEXT FOR LONG-TERM EMISSIONS REDUCTIONS

From the first law to protect rivers from the impact of gold mining in 1884, to decades of work to fight smog, California has played a leadership role in setting standards for environmental protection. Alongside ambitious environmental policies, California has grown to become both the fifth-largest economy in the world and home to some of the world's most innovative companies. California has adopted and continues to bolster the 2030 GHG target of achieving 40 percent reductions below 1990 levels and aims to reduce GHG emissions to at least 80 percent below 1990 levels by 2050.

### Objective and purpose of the scoping plan

The scoping plan process is viewed as a necessary step to better understand how each of California's existing policies, alongside potential new policies, may help the state achieve emissions reduction goals and what their potential impacts may be on the state's economy, jobs, and households.

California's 2017 scoping plan lays out a suite of policies that in turn provide a cost-effective and technologically feasible path to develop new and enhance existing policies to achieve the state's 2030 emissions reduction target, and to stay on track to achieve a low- to zero-carbon economy (Figure 2).

California's policies have historically created markets for energy efficiency (CEC 2019a), zero-emission vehicles (CARB 2019f), low-carbon fuels (CARB 2019d), and renewable power (CEC 2019b)—including utility-scale and residential-scale solar. The Zero Emission Vehicle (ZEV) program—alongside cap and trade (CARB 2019b), the Low Carbon Fuel Standard, and vehicle emission standards—has cemented California's position as a leader in electric vehicle adoption; California electric vehicle registration alone accounts for more than half of the electric vehicles in the United States (Alliance of Automobile Manufacturers 2019). Through land-use policy motivated by Senate Bill (SB) 375, California is also trying to advance the transportation planning process to help reduce vehicle miles traveled and increase efficient land use.

## Evolution of California climate policy

California has a long history of adopting energy and environmental policies. These policies were traditionally used to reduce criteria pollutants and improve local and regional air quality. Drawing from institutions first established to combat local environmental problems, the state has been successful at adapting existing policy while creating new policies specific to the challenge of climate change.

The California Energy Commission (CEC) first adopted efficiency standards for buildings in the 1970s as a way to reduce local environmental impact as California's economy grew. Over time the CEC has expanded and improved these standards, increasing the scope and relevance of GHG emissions reduction goals.

Since 1990 California has relied heavily on the Zero Emission Vehicle program to reduce smog-forming pollutants and improve air quality in nonattainment areas across the state. The ZEV program has been updated regularly and the deployment target increased over time as technology has developed to better facilitate the deployment of low- and zero-emission automobiles, helping to reduce criteria emissions alongside GHG emissions.

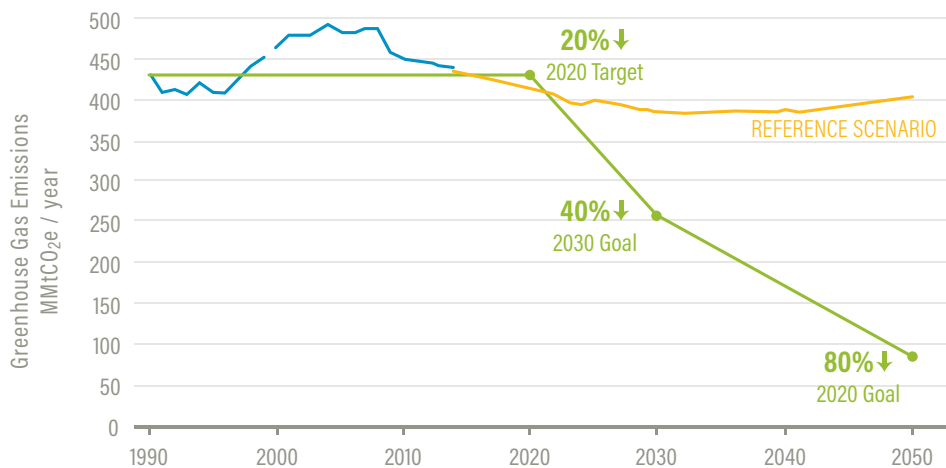
In 2002, the California legislature adopted AB 1493, directing the California Air Resources Board (CARB) to adopt the maximum feasible and cost-effective reductions in GHG

emissions from light-duty vehicles. This legislation was the first to directly establish a requirement to consider GHG emissions alongside criteria emissions for light-duty vehicles. The regulations following this legislation formed the foundation of California's Advanced Clean Cars program and the federal GHG and fuel economy programs for light-duty vehicles for 2012–16 model years, substantially improving vehicle fuel economy nationwide.

California's AB 32 marked a step forward in California's overall regulatory landscape by establishing economy-wide GHG emissions reduction targets. While a dramatic departure from traditional, local air quality environmental regulation, AB 32 helped better direct ongoing development of climate policy in California, and pushed the state forward toward developing a strong GHG emissions inventory. AB 32 marked the start of a new era in California climate policy, promoting specific GHG emissions reduction regulations guided by the scoping plan process.

One of the key policies identified in the initial scoping plan was California's cap-and-trade program, which was adopted in 2011 and implemented in 2012. California's cap and trade is a market-based mechanism that covers 80 percent of the state's total emission sources and a breadth of economic sectors (including production facilities, electricity deliverers, suppliers of natural gas, suppliers of fuel, and carbon dioxide suppliers)

Figure 3. California's vision for 2030



REDUCING GREENHOUSE GAS EMISSIONS TO  
**40%↓**  
**1990** LEVELS

Source: CARB (2017).

that is unrivaled in scope compared to other carbon pricing policies worldwide, except for those of its linked partner, Québec. Given the shift in California regulation to directly target GHG emissions, the cap-and-trade program was not without controversy, and it was met with a variety of legal challenges, but it was able to remain in place and continued to gain support in the legislature.

Following AB 32, the low carbon fuel standard (LCFS) was also created, becoming one of the first life-cycle assessment-based policies adopted worldwide. The LCFS is an adaptable performance standard that uses a market-based approach to drive reductions in fuel carbon intensity. The policy helps spur technological developments in fuel production—motivating innovation in biofuels like renewable diesel and biomethane, as well as the electricity fuel pathways for electric vehicles. The LCFS has also faced a variety of legal battles that delayed its implementation, but the policy has largely been able to overcome these challenges. Similar policies have been adopted in Oregon and British Columbia, and LCFS-like policy is currently under development in Canada.

## The current status of California's long-term climate plan

The 2014 scoping plan recommended that the state establish a 2030 emissions reduction target, and included comment from the public calling for California to reduce its energy use and transition to 100 percent renewable energy. The 2014 scoping plan inspired discussion about establishing midterm (2030) emissions goals (Figure 3). This led directly to Executive Order (EO) B-30-15 and the eventual development of SB 32 with specific 2030 reduction targets, which was passed along party lines (similar to AB 32 in 2006, only one Republican in the state assembly voted “yea”). EO B-30-15 directed CARB to update the scoping plan to better assess scenarios for achieving 2030 midterm targets. Since the 2017 scoping plan, additional legislation (SB 100) was passed by the California legislature, requiring the state to plan for 100 percent of retail electricity from zero-carbon sources by 2045. Executive Order B-55-18 calls for the scoping plan process to determine how California can achieve carbon neutrality by midcentury.

These new actions further underscore the need for the scoping plan process to help establish long-term GHG emissions reduction strategies. The scoping plan is an essential guide for policymakers to help determine stringency, and to better understand where each policy might fit in achieving emissions reductions.

## CALIFORNIA'S SCOPING PLAN PROCESS

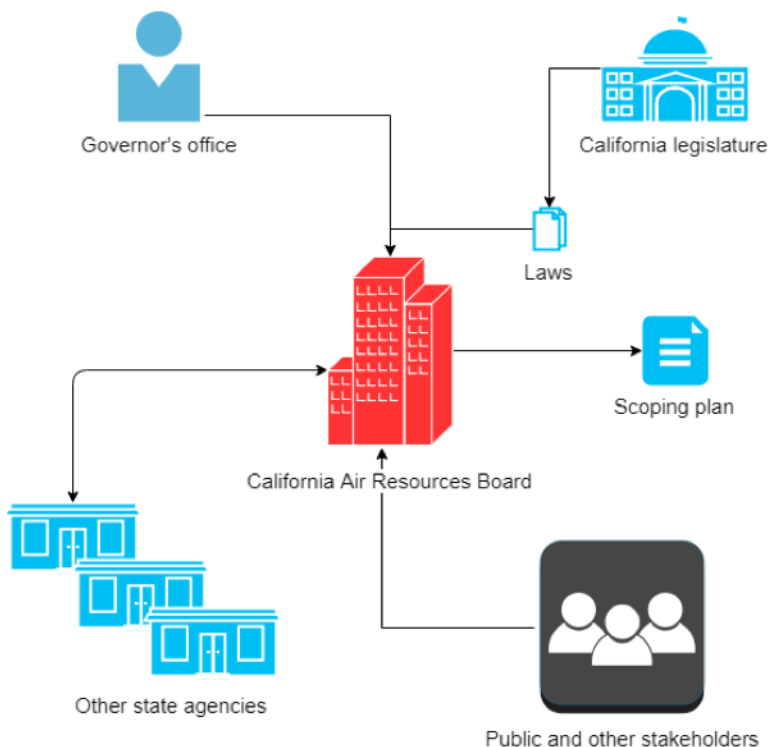
The scoping plan process is executed by CARB, and the end result helps other state agencies determine what policies may be achievable and cost-effective, while also identifying additional policies or regulations that may be necessary to reduce GHG emissions in line with legislated targets and goals. The scoping plan process has also been used to help inform the legislature and governor's office about policy pathways and actions that may help achieve emissions reductions. All greenhouse gas rules and regulations adopted by CARB are consistent with the most recently adopted scoping plan. This section details the role of various branches of government and the public in the scoping plan process (Figure 4).

### The governor's office

Both the legislature and the governor can use conclusions from the scoping plan process and require new plan updates. The most recent update to the scoping plan was initiated by Governor Jerry Brown (D) through Executive Order B-30-15, which created a specific 2030 reduction target of 40 percent below 1990 levels. This midterm target was established to better create an emissions reduction pathway consistent with achieving long-term emissions reductions of at least 80 percent below 1990 levels by 2050. Governor Brown's office further laid out the following guiding principles (CARB 2016) for the 2017 scoping plan:

- ◆ Reducing petroleum use
- ◆ Increasing renewable electricity
- ◆ Increasing building energy efficiency
- ◆ Reducing short-lived climate pollutants
- ◆ Ensuring that natural and working lands are carbon sinks

Figure 4. Scoping plan participant overview



Source: CARB (2017).

As the scoping plan currently has buy-in from all branches of government, it has acted as a guiding document for actions that can take place in the legislature and other state agencies.

## California's legislature

With adoption of AB 32, the state embarked on the process of documenting and inventorying economy-wide emissions and initiating the scoping plan process.

Following EO B-30-15, the legislature also affirmed the 2030 GHG emissions reduction targets. SB 32 was passed as the 2017 scoping plan was being developed, creating legal certainty around midterm targets. Additional companion legislation was passed that removed lingering legal uncertainty around the use of market-based mechanisms, like California's cap-and-trade

program, a key policy relied on in the scoping plan to achieve emissions reduction targets, and provided some direction on the design features of the post-2020 cap-and-trade program.

## The California Air Resources Board

CARB is California's primary agency responsible for protecting the public from the harmful effects of air pollution and for developing programs and actions to fight climate change.

To understand the policy actions necessary to substantially reduce emissions, a strong emission inventory is essential. Directed to conduct an emissions inventory prior to the first scoping plan, CARB established a mandatory reporting regulation (CARB 2019e), which included third-party verification of reported data. This bottom-up reporting supports the

development of the state’s GHG inventory, which has been relied on to help support the update to each scoping plan and track progress toward achieving the statutory GHG reductions targets.

## Other state agencies

Over 20 state agencies collaborated with CARB, providing feedback and guidance on relevant science and economics, to produce the 2017 scoping plan. These interactions helped inform inputs to the PATHWAYS model, as well as model development and calibration to align with the numerous policies the state employs to regulate each economic sector considered in the scoping plan. The 2017 scoping plan was informed by 15 state agency–sponsored public workshops and more than 500 public comments that helped shape and guide the plan.

Given the extensive process of collaboration across agencies, results from the 2017 scoping plan are consistent with rulemaking that occurs outside of CARB, which allows the scoping plan to remain relevant to all state organizations.

## The public and other stakeholders

Throughout the scoping plan process, CARB convened workshops to directly solicit feedback from the public in relation to modeling activities affiliated with PATHWAYS, Regional Economic Models Inc. (REMI), and the various other models used to inform PATHWAYS inputs, as well as the overall scenarios and strategies that were ultimately considered for achieving 2030 targets.

California has also made considerable effort to involve disadvantaged communities in discussing GHG mitigation options and informing the scoping plan. AB 32 required the creation of the Environmental Justice Advisory Committee (EJAC) to advise CARB in developing the scoping plan and any other pertinent implementation matters. This committee draws from communities in the state with the most significant exposure to air pollution (communities with minority populations, low-income populations, or both). Nine members were appointed by the board in 2013, and four new members were appointed in September 2015. For the 2017 scoping plan, the EJAC convened almost 20 community meetings throughout California to discuss the climate strategy, and it held 19 meetings of its

own to provide recommendations on the 2017 scoping plan. One key message conveyed to CARB was the need to emphasize reductions at large stationary sources, with a particular focus on multipollutant strategies for these sources to reduce GHGs and harmful criteria and toxic air pollutants that result in localized health impacts, especially in disadvantaged communities. Other consistent feedback for CARB included the need for built and natural infrastructure improvements that enhance quality of life, increase access to safe and viable transportation options, and improve physical activity and related health outcomes.

## EMISSIONS MODELING

Starting with a subset of identified economic sectors of interest and California’s economy-wide emission inventory, the state has been able to use science and economic modeling to help inform long-term emissions reduction planning and targets. Originally commissioned as part of the California PATHWAYS project, the PATHWAYS model was built by Energy + Environmental Economics (E3) and provides an integrated modeling environment to assess emissions across several techno-economic sectors, enabling scenario analysis to assess policy options and the impact that each policy may have on state emissions as a whole. PATHWAYS includes technology-rich modeling for the following sectors:

- ◆ Residential
- ◆ Commercial
- ◆ Other industrial
- ◆ Transportation
- ◆ Petroleum refining
- ◆ Agriculture
- ◆ Water-energy and water–transportation, communication, and utilities
- ◆ Oil and gas extraction

Each scoping plan is developed to improve understanding of the links between existing policies and potential future policies, and how emissions from economic sectors of interest can be reduced. CARB built on the Energy PATHWAYS

project by commissioning new updates to PATHWAYS for the 2017 scoping plan that helped improve understanding of reduction target assessments and how California policies interact. PATHWAYS is a user-defined, economy-wide model that captures interactions between sectors and allows for development of realistic and concrete GHG reduction roadmaps (E3 2016). For the 2017 scoping plan, additional PATHWAYS model complexity was added to facilitate better assessment of emissions from each economic sector under consideration, and to help integrate many existing California policies into a unified framework to provide scenario analysis for achieving emissions reductions. Updates to PATHWAYS included more detail on California fuel use necessary to better capture effects of the low carbon fuel standard, while other updates were made to improve understanding of how vehicle efficiency and electrification of the transportation system may influence emissions. The PATHWAYS model facilitates policy impact assessment and economic impact assessment, so the state and public can better understand the likely collective and interactive impacts on different California economic sectors as part of achieving 2030 targets in line with the 2050 emissions reduction goals.

The scoping plan specifically defines strategies and actions for the following sectors: energy, transportation, industry, water, waste management, agriculture, and natural and working lands. Many of the underlying data and assumptions that go into PATHWAYS come from additional sector-specific models and tools that are more detailed, and look at specific attributes of each sector in the economy. For instance, CARB's VISION model links a variety of vehicle and fuel uses together to understand how criteria emissions are likely to change in different California air basins over time. Comparatively, the California Biofuel Supply Module looks at how the low carbon fuel standard will change the makeup of the California fuel pool overtime. The input assumptions from CARB's policy-specific and sector-specific models were fed into PATHWAYS, and the PATHWAYS model was calibrated to be consistent with results from each model that the state uses for regulation.

In addition to PATHWAYS and the myriad of other models used to inform inputs into the PATHWAYS model, CARB relied on REMI (LEDS Global Partnership 2015) to conduct macroeconomic analysis for different emissions reduction scenarios. REMI shows the likely impacts of shifts in each

economic sector on the California economy as a whole. Results from these models allowed CARB to evaluate a set of different scenarios, and ultimately to select scenarios capable of achieving emissions reduction targets at low economic cost.

In addition, the economic analysis portion of the 2017 scoping plan was vetted through a peer review process. An independent panel of economic reviewers provided comments on the methodologies employed, the key inputs and assumptions, the results, and the interpretation of results, which were presented in the economic supplement to the plan. The panel was also asked to comment on any additional analysis that CARB should consider incorporating during implementation of the 2017 scoping plan.

The original PATHWAYS model was updated for the 2017 scoping plan to reflect recent policy developments and targets, such as updates to California's renewable portfolio standard, the Advanced Clean Cars program, the low carbon fuel standard, and others. These policies, combined with the high-resolution sector-specific considerations, were used to create a baseline scenario for statewide emissions through 2050. To better understand what would be necessary to achieve the midterm targets legislated in SB 32, feedback was gathered from the public and from the technical teams of CARB and other state agencies to understand which policies might be expanded, and where additional policies should be considered.

This feedback was used to develop a set of scenarios, which were assessed using PATHWAYS. Each scenario provided a different set of policy options, targets, and configurations to improve understanding of impacts and to help determine the policy changes necessary to promote reductions across specific economic sectors.

The final 2017 scoping plan provided details for a state-preferred scenario (the scoping plan scenario) as well as some discussion about four other scenarios that were evaluated but ultimately rejected. The scenarios analyzed to meet California's midterm and long-term climate goals were the following:

**Scoping plan scenario:** Ongoing and statutorily required programs and an increasingly stringent cap-and-trade program.



**Alternative 1:** No cap and trade. Additional activities in a wide variety of sectors, such as specific required reductions for all large GHG sources, and more stringent requirements for lower carbon energy in the electricity and transportation sectors. Industrial sources would be regulated through command and control strategies. The Alternative 1 scenario was considered as part of feedback from the EJAC, which preferred direct reduction measures instead of cap and trade, due to concerns about criteria emissions. This option was ultimately rejected as it would require additional statutory authority to implement additional GHG reduction measures, and would result in substantially higher economic costs to the state and households in order to achieve the emissions reduction targets.

**Alternative 2:** Carbon tax. A carbon tax to put a price, but not a limit, on carbon, instead of the cap-and-trade program. Alternative 2 was put forward by some academics, the EJAC, and nonprofit organizations that either thought prices higher than expected in the cap-and-trade program were needed to aggressively reduce GHG emissions or that every emitted ton should be valued at the social cost of carbon. This measure was ultimately rejected for several reasons: (1) it is difficult to set the appropriate tax value to achieve a specific reduction target, (2) there is no apparent mechanism other than exemptions to minimize leakage, (3) additional legislative authority would be necessary, (4) opportunities for linkages would be more complicated, and (5) costs to the economy and to households were higher than expected.

**Alternative 3:** All cap and trade. This alternative is the same as the scoping plan scenario, but the low carbon fuel standard is limited to a 10 percent reduction in fuel carbon intensity compared to 18 percent in other scenarios. Alternative 3 was put forward by industry, and strongly favored by oil and gas companies, as it limited reliance on the low carbon fuel standard to reduce emissions from transportation. Given that cap and trade is economy-wide, a cap-and-trade-only approach was rejected as it was deemed inappropriate to transform the fuel mix in transportation—

the largest sector of GHG emissions, and the state already had policy in place to reduce emissions to directly target the electricity sector through the renewable portfolio standard. Without substantial changes to the transportation system motivated by midterm emissions reduction targets, it would become more difficult to decarbonize transportation as part of achieving long-term emissions reduction goals. Most important, the low carbon fuel standard had already been identified as a needed measure to help the state achieve federal air quality mandates.

**Alternative 4:** Cap and tax. This would place a declining cap on individual industrial facilities, and individual natural gas and fuel suppliers, while also requiring them to pay a tax on each metric ton of GHGs emitted. A cap-and-tax scenario was ultimately rejected as it had the highest economic cost to the state and to households.

Given SB 32 and the legislated requirement to reduce emissions to 40 percent below 1990 levels by 2030, some of the alternatives did not provide as much certainty about achieving emissions reductions. For instance, although Alternative 2, a carbon tax, provided price certainty, it did not provide certainty that emissions would be reduced. Economic factors, efforts to scale policies to other regions, and other factors also led to the choice of the scoping plan scenario, which balanced relying on existing state policies and regulations, strengthening other policies, and outlining new policies that should be implemented in order to achieve midterm and long-term reductions. As part of the 2017 scoping plan, CARB also developed an uncertainty analysis that identified the suite of policies that, coupled with the cap-and-trade program, had the highest certainty of achieving the 2030 target under a variety of economic and fuel price scenarios.

## SCOPING PLAN IMPLEMENTATION

California's climate policy implementation has been a resounding success in making progress toward the statutory targets. Since AB 32, the state has been able to substantially reduce emissions and has even achieved 2020 emissions reduction goals early, with 2016 emissions falling below 1990 emissions levels, all while growing the state's economy. Earlier iterations of the scoping plan itself called for instituting midterm

targets to improve the transition to long-term emissions reduction goals. The 2014 scoping plan resulted in the enactment of new legislation to establish midterm reduction goals, spurring an update of the scoping plan and pushing California forward on the path toward deep decarbonization.

The scoping plan has led to the implementation of and support for California's cap-and-trade program by the regulated community, as well as legislative action to enact AB 398, which provided details on the role of a post-2020 cap-and-trade program. But, while the state's aggregate GHG emissions have declined, transportation remains a challenging sector. As such, a majority of policies in the scoping plan target this sector, and additional work continues to evaluate further options to reduce emissions from all aspects of transportation. One response to this sector was to continue to include the low carbon fuel standard in the recent 2017 scoping plan. The most recently adopted LCFS has established strong targets to reduce the state's fuel carbon intensity by 20 percent by 2030, compared to the 18 percent reduction target called for in the scoping plan and the target of 10 percent by 2020 that existed prior to finalizing the 2017 scoping plan. The 2017 scoping plan further identifies the need to strengthen the Zero Emission Vehicle program, as well as to strengthen programs to reduce emissions from medium-duty and heavy-duty vehicles, support sustainable land use to reduce vehicle miles traveled, ensure reduction contributions from short-lived climate pollutants like methane and hydrofluorocarbons, improve freight efficiency, and continue California's cap and trade beyond 2020.

Because the scoping plan identifies transitions that can happen across specific economic sectors, it helps define emissions reduction contributions that may come from California's already-existing environmental policy with some modification. Drawing on California's history of enacting and gradually increasing the stringency of environmental regulation over time, many GHG emissions reduction policies, like the low carbon fuel standard, were designed to be regularly updated and strengthened, and other environmental policies have been updated to consider GHG emissions alongside criteria pollutants and other local environmental considerations. By creating flexible policies, regulations and targets can be set with the ability to adjust to unexpected technology innovation and adoption. As such, many

of California's existing environmental policies are well-suited for further adaptation to achieve long-term targets and emissions reductions defined through the scoping plan process. It is this policy flexibility, alongside California's commitment to reduce GHG emissions across all branches of government, that has led to the implementation and success of effective climate policies.

## CALIFORNIA'S LONG-TERM PLANNING SUCCESS

The California climate policy story to date has been a unique success, especially given the ongoing U.S. national context. All branches of California government have played a role in establishing and reaffirming strong commitments toward reducing GHGs. California's ability to enact and enforce meaningful GHG mitigation policies stems in part from its long-held identity as an environmental leader. Amid a strong economy and with dedicated leadership, California has adopted rules and regulations through transparent and public processes to engage stakeholders and communities with a diversity of ideas and opinions.

Future success on the climate policy front is not guaranteed; diligence and continued commitment to public engagement will be needed to promote emissions reductions in the coming decades. New and updated policies to further decarbonize the economy will be necessary as California transitions to deep decarbonization of the electricity grid and toward achieving carbon neutrality. Future policy development will include identifying new approaches to reducing emissions from not only transportation and electricity but also industry, buildings, and agriculture. It also will require a focus on carbon sequestration actions.

A key element of California's approach continues to be careful monitoring and reporting on the results of our programs and a willingness to make midcourse adjustments. As the state looks to 2030 and beyond, all sectors of the economy must benefit from these ideas.

## LESSONS LEARNED

Belief in California's identity as an environmental leader has led all branches of state government to become involved in setting and reaffirming California's climate policy, using the

long-term planning process as a guide for action. A transparent public process for rulemaking has further allowed the public to influence and support emissions reduction policy, enabling California to establish a long-term plan and adopt regulations and strategies that directly align with the plan. The success of California’s emissions reduction strategy leads to several conclusions:

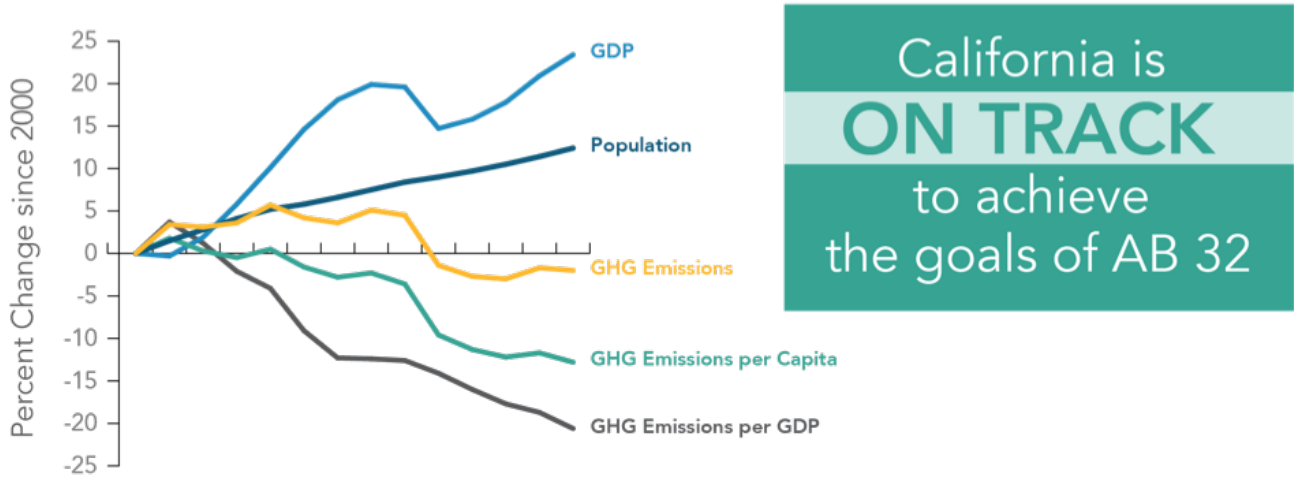
- ◆ GHG regulation is achievable with a growing economy.
- ◆ Climate policy must consider all communities, with special attention paid to disadvantaged communities to ensure equitable benefits and to adequately address concerns.
- ◆ Science-informed policy improves resilience and outcomes, and is preferable for achieving emissions reductions.
- ◆ Starting programs at different points and with different goals, and aligning them over time, is not only possible but enables flexible and adaptive policymaking.

California’s emissions reduction policy has demonstrated that substantial environmental progress can be made without harming the economy (Figure 5). Since the launch of many of

the state’s major climate programs, including cap and trade, economic growth in California has consistently outpaced economic growth in the rest of the country. The state’s average annual growth rate has been double the national average—and ranks second in the country since cap and trade took effect in 2012. The scoping plan process helps identify which economic sectors are likely to be bolstered, and which sectors may face higher costs and become less competitive. By detailing these issues, and considering a variety of strategies through a public process, stakeholders can better understand the cause and effect of policy.

The state is pioneering targeted environmental and economic development programs to help those most in need. So far, half of all California Climate Investments (2019), funded by the state’s cap-and-trade program, have been used to provide benefits in California communities most disadvantaged by environmental and socioeconomic burdens. This has included funding for low-carbon transportation (e.g., additional grants for low-income households), targeting weatherization and renewable incentives in disadvantaged communities, urban forestry projects, low-carbon transit operation funding, and more. By increasingly

**Figure 5. Emission reductions are possible even with a growing population and economy**



Source: CARB (2018).

**Figure 6. California’s cap-and-trade revenue helps promote emissions reduction projects**



Source: California Climate Investments (2019).

engaging with these communities—investing in technical assistance resources, holding listening sessions, improving state programs, and accelerating state efforts to bring the cleanest technologies to mass market—all California residents can have clean air to breathe, clean water to drink, and opportunities to participate in the cleaner economy (Figure 6).

The scoping plan process and California’s climate policy in general have heavily relied on the scientific community, the best science for determining feasible strategies, and best available modeling tools to develop and adapt policy to spur technology innovation alongside emissions reductions. From the ZEV mandate to the low carbon fuel standard, recent scientific research and methods have helped define policies and determine what is feasible. As scientific understanding has improved and the cost of emission control technologies has declined, California has been able to expand provisions for existing policies to better consider GHG emissions reductions, and to adopt or strengthen new GHG-specific policies. The low carbon fuel standard, specifically, marks remarkable success for science-informed policy. The LCFS uses life-cycle assessment to account for emissions not only in-state but also across the entire fuel life-cycle to prevent leakage. This approach more directly accounts for relevant emissions in the transportation fuel space. The LCFS has recently been modified to further encourage emissions reductions and has been expanded to better incentivize adoption of low-carbon transportation solutions like electric vehicles and hydrogen infrastructure. The LCFS highlights California’s standard approach to environmental regulation of regularly updating and adapting existing policies to improve outcomes as the related science and technology mature.

Ultimately, California’s planning process is a continuation of the environmental leadership role that has been part of the state’s identity for decades. Environmental policies are adopted, adapted, strengthened, aligned, and expanded over time to better address environmental issues and make sure all Californians benefit. As California transitions from midterm to long-term planning, this approach should continue to be successful, providing real GHG emissions reductions while ensuring that all interested stakeholders and all branches of government are active in determining the path forward.

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## ABOUT THE AUTHORS

### JEFF KESSLER

is a policy analyst and researcher and works with the California Air Resources Board on policy assessment. He holds a doctorate from the University of California, and has continued to research and assess how low-carbon technologies and climate policy may be used to promote decarbonization efforts in the United States and California.

### RAJINDER SAHOTA

is a climate scientist and policy analyst who works at the California Air Resources Board as an assistant division chief overseeing many of the state's climate policies, including the cap-and-trade program. She holds a bachelors and masters of science from the University of California and continues to evaluate how deeper decarbonization may be achieved across all sectors of the economy.

## ABOUT THE LONG-TERM STRATEGIES PROJECT

World Resources Institute and the United Nations Development Programme, working closely with UN Climate Change, are developing a set of resources to help policymakers integrate long-term climate strategies into national policy making.



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For more information about the project, and to view the expanding set of resources, visit [www.longtermstrategies.org](http://www.longtermstrategies.org).