350 San Francisco
350 East Bay
350 Marin
350 Sonoma
Napa Climate Now
350 Contra Costa

Liane M. Randolph, Chair
Board Members
California Air Resources Board
1001 “I” Street
Sacramento, CA 95814

RE: We need a Climate Plan that defeats climate chaos and delivers environmental justice

Dear Chair Randolph and Board members,

Thank you for this opportunity to comment on the 2022 Draft Scoping Plan. 350 Bay Area is one of the largest grassroots climate advocacy groups in Northern California with over 20,000 supporters. We have participated in almost all of the scoping plan workshops and have listened closely to the EJAC-specific meetings. Below we summarize our comments and include several detailed Appendices.

Our comments on the Draft Scoping Plan are informed by participating in the planning process and reviewing CARB and other state agency policies, plans and reports, and also by our extensive climate work with local governments and regional agencies supporting Community Choice Energy programs (CCAs), building decarbonization efforts, Bay Area Refinery and Port climate and anti-pollution actions, climate education with school districts and numerous civil society groups, and working with diverse coalitions to promote and support the implementation of many climate justice solutions written into plans and talked about in the Scoping Plan. This work gives us a realistic assessment of “what it takes” to move to more rapid and ambitious climate action that is consistent with most recent science and being in a climate emergency.

We have three main comments on the Draft Scoping Plan:

1. This draft plan fails to ensure that California will meet the SB 32 requirement to reduce 40% GHGs by 2030.

Although the PATHWAYS spreadsheet does not show its calculations, the assumptions stated in the Plan demonstrate that the plan cannot achieve the cuts required. Before its adoption, the Plan must provide detailed proposals and calculations to show that it can comply with SB32’s 2030 goals.

- **The Transportation Sector needs deeper cuts:** The Scoping Plan assumes 5 million EVs by 2030 and 12% per capita VMT reductions, but these will not achieve 40% GHG reductions in light duty vehicle emissions, which are easier to achieve than in heavy duty vehicles, shipping, and aviation. Both EV adoption and VMT reduction need to be accelerated with focus on low income communities. See detailed discussion and calculations below in Appendix 1.
- **The Plan needs to phase out production of oil and gas:** (extraction by 2035 and production by 2045), with limited transitional production of so-called "renewable fuels" or biofuels and with production of only green hydrogen (not blue or gray). In addition, the Plan should not consider any new natural gas plants. See Appendix 2 for more discussion.
- **Natural Carbon Sequestration must have a greater role in reducing GHG in the atmosphere [Natural & Working Lands]** See detailed discussion in Appendix 3, below.
- **The Plan needs to emphasize and accelerate clean Distributed Energy Resources (DER)** for affordable electricity to meet building and transportation electrification goals (see Appendix 4, below).
    - Also, the goal for 100% renewable electricity should be 2035, not 2045.

2. We strongly support the concerns and recommendations made by the Environmental Justice Advisory Committee (EJAC) on the draft plan

When this critical advisory committee was convened last June by CARB, Chairwoman Randolph expressed a commitment to work closely with the representatives of frontline and indigenous communities. We have watched their hard and dedicated work in dozens of scoping and EJAC workshops and meetings with CARB staff as the draft plan has come together. We are very concerned that CARB is failing to respect, acknowledge, and utilize the many thoughtful and critical analyses and recommendations members of the EJAC have put forward. They have demonstrated unique knowledge of the specific communities they represent, but beyond that, we feel that they are providing an essential voice for the much larger public of Californians who value our health, equitable solutions and a stable climate now and in the future.

We want to reiterate our support for the EJAC's priorities and recommendations (e.g. see this press release from the California Environmental Justice Alliance), which we feel the 2022 Scoping Plan must address if it is to be successful for California and beyond.

3. The modeling and economic analyses for the Scoping Plan are unrealistic and based on biased and non-transparent assumptions

- The comparison of the four Scoping Plan alternatives is based upon assumptions that **overstate the costs to faster phasing out of the oil**

and gas industry, and understate costs of Carbon Capture and Storage (CCS) and health impairment. An over reliance on CCS and Direct Air Capture (DAC) results from unrealistic estimates of their net costs, actual effectiveness, and probability of successful implementation. The costs to the economy and jobs must be based on unbiased and realistic assumptions, which show very little impact to California's dynamic, diverse and innovative economy. (See Economic Analysis Appendix below)

- The IEA (International Energy Agency) roadmap to net zero by 2050 includes **no new investment in new fossil fuel projects**. CARB's proposed scoping plan goes against this IEA mandate. It includes the equivalent of building 33 new fossil gas plants, new investments in refineries and infrastructure to produce blue hydrogen instead of green hydrogen, and new investments to capture CO2 for extraction of oil and gas for production of "low carbon" petrochemicals. These investments should instead focus on producing, storing, and distributing renewable energy, and restoring natural carbon sinks of wetlands, peatlands, soil, and forests. The use of CCS should be limited to hard-to-decarbonize sectors, with extraction of oil phased out by 2035 and refining phased out by 2045.
- **The need for transparency.** The public has not yet been given access to the information required to evaluate the models used by CARB to assess the relative benefits and costs of specific policies to meet climate goals. The use of the proprietary models PATHWAYS and IMPLAN, which are based on specific assumptions that may not be applicable to the scenarios, results in a method that is not transparent and not replicable. The estimated economic and health results presented in the draft CARB Scoping Plan and workshops are highly aggregated and provided without any acknowledgement of the range of uncertainty. The draft scoping plan and workshops make a mockery of "public review" and prevent meaningful engagement.

Summary

CARB must focus on reducing greenhouse gas emissions, with a strong foundation in equity and justice, to minimally reach the state's 2030 goals, and set measurable and achievable goals every five years to ensure that we reach carbon neutrality no later than 2045. These goals must not rely on carbon capture (smokestack and direct air capture) for more than minimal emissions reductions.

Thanks for your work on this vital document.

Sincerely,

Jack Lucero Fleck, PE Transportation, Co-chair 350 Bay Area Transportation campaign

Valerie Ventre-Hutton, MS, MBA, Co-lead 350 Bay Area Action End Fossil Fuels Action Legislative Team

Kathy Dervin, MPH, former 350 Bay Area Action Legislative Co-Coordinator
former CDPH Climate and Health Equity Program Coordinator

Clair Brown, PhD, Professor of Economics, University of California, Berkeley

Claire Broome, MD, Co-chair 350 Bay Area Clean Energy campaign

See Appendices below

APPENDIX 1–Transportation Sector Analysis

Key finding

The failure of the draft Scoping Plan to meet State GHG objectives is most glaring in the Transportation sector. The Plan falls short of the SB32 required 40% cuts by 2030 and will need to accelerate its programs to achieve that goal. Also, the fact that, under the Plan, there will still be gas cars sold after 2030, means that these cars will be on the road in 2045. This delay in eliminating gas cars causes the Scoping Plan to pin hopes on unproven and expensive Carbon Capture and Storage technology; instead, it should focus on proven, cost-effective, **direct emission reduction** technologies, especially electric vehicles with emphasis on low income communities, as detailed below.

Transportation Emission Reductions Shortfall

The draft Scoping Plan includes a Modeling Spreadsheet that can be downloaded here. The numbers from this spreadsheet, based on the PATHWAYS model, are used in this analysis. As noted above, the PATHWAYS spreadsheet does not include calculations for its numbers. Therefore, this comment uses assumptions from the draft Scoping Plan to make the calculations.

Table 1 shows that the PATHWAYS spreadsheet is estimating 77 Million Metric Tons (MMT) in GHG reductions from the transportation sector by 2030. This is a huge reduction, and is critical to achieve for the Scoping Plan to meet its goals.

Table 1–Transportation GHG Emissions in Draft 2022 Scoping Plan

All units in MMT

	1990	2019	Scoping Plan Goal for 2030 (PATHWAYS Spreadsheet)	Scoping Plan Cuts proposed from 2019	2030 Cuts likely with Scoping Plan
Transportation (including TCU*)	152	163	86	77	47

*TCU–Transportation Communications and Utilities–about 5 MMT in 2020

The four ways 77 MMT of cuts could be achieved are

- Conversion to Zero Emission Vehicles (ZEVs–both cars and trucks)
- Reduction in Vehicle Miles Traveled (VMT)
- Biofuels (diesel only)

- Fuel Efficiency

The calculations in this document show the following likely Transportation reductions from the Scoping plan and PATHWAYS spreadsheet:

Table 2–Summary of Transportation reductions comparing Scoping Plan with calculations here

	Scoping Plan likely reductions (MMT)	This comment's calculation of possible reductions (MMT)
ZEV Light Duty Vehicles	13	35
ZEV Trucks	3	3
VMT	10	20
Biofuels	3	3
Fuel Efficiency – LDV	18	18
Totals	47	79

Table 2's 47 MMT in likely reductions is 30 MMT short of the 77 MMT shown in the PATHWAYS Spreadsheet for reductions from Transportation. Note that the VMT reduction of 10 MMT is calculated based on numbers in the Scoping Plan; the PATHWAYS Spreadsheet number is 10 MMT more than the number calculated from the Scoping Plan and matches the 20 MMT shown in column 3 of Table 2. Also, the problems with biofuels are discussed in Appendix 2.

In spite of the Scoping Plan's shortfall in reductions, if additional steps are taken as proposed in this comment, the State can achieve the necessary cuts in GHGs from Transportation as shown in column 3 (estimate of 79 MMT reductions) of Table 2 and discussed below.

What needs to be done?

The Scoping Plan needs to make much more concrete plans and show its calculations to demonstrate that the plan can achieve the stated GHG reduction of 77 MMT by 2030.

There are many actions that could help achieve the 77 MMT goal. Here are six actions needed in the Transportation sector.

1. Phase out the sale of ICEVs by 2030. This would mean 8 million EVs on the road (see calculation Note 1) in 2030 and would add another **13 MMT** in GHG reductions.
2. Support individuals and companies in working from home, including subsidies for home offices or workspaces near home. 2020 showed that VMT could be seriously reduced if people work from home. This calculation (Note 2) shows that a 10% per capita VMT reduction is possible with continued working from home. Combined with funding for transit and active transportation, as called for in the Climate Action Plan for Transportation Infrastructure (CAPTI), this could make the high VMT reduction estimate from the spreadsheet valid–i.e. 20 MMT reduction instead of 10 MMT as projected by the Scoping Plan–**10 MMT** additional reduction.
3. Incentivize heavy gasoline users, especially low income drivers, to convert to EVs (e.g. AB 2816). This calculation (Note 3) shows that making sure that heavy users receive priority in subsidies to convert to EVs could be the equivalent of 2 million more EVs, i.e. another **9 MMT** reduction. Even though AB 2816 stalled this year, CARB could make this regulatory change without legislation.
4. Make sure that high speed chargers are plentiful along all major highways and in older urban areas near housing without off-street parking. This will eliminate one of the main concerns that deters EV purchases. Caltrans should consider such installations as part of infrastructure improvements, i.e. part of its $30 billion budget.
5. Provide low cost loans, financed by revenue bonds, using Tariff-on-bill-financing (SB 1112) to ensure that anyone buying an EV will have a place to charge at their home, including multi-family dwellings.
6. Simplify subsidy and incentives delivery (SB 1230) and generally promote EVs in a very public way.

Steps 1 - 3 would add 13 + 10 + 9 = **32 MMT** in additional reductions to the 47 MMT reductios likely from the Scoping Plan. This would bring the total for Transportation reductions to **79 MMT,**

Steps 4 - 6 and more like them will help spur the market to achieve rapid adoption of EVs, potentially increasing the reductions from steps 1 - 3.

These steps would overcome the 30 MMT shortfall in reductions shown in Table 2 and described here.

Conclusion of Transportation Comments

These comments take specific assumptions from the Scoping Plan and its PATHWAYS Spreadsheet to calculate projected emissions for the Transportation Sector. The calculations show that the assumptions in the Scoping Plan mean that the Transportation sector **will not achieve the reductions needed to achieve 40% GHG reductions by 2030.** Accelerating the transition to EVs, along with other measures to reduce Vehicle Miles Traveled will be required to overcome this shortfall.

APPENDIX 2–Economic Analysis

Clair Brown, Professor of Economics, University of California, Berkeley

Macroeconomic Analysis

The Macroeconomic analysis is critical in CARB's comparison of the four scenarios. However the Macro analysis is based upon unrealistic assumptions that **overstate the costs to faster phasing out the oil and gas industry, and understates costs of Carbon Capture and Storage (CCS) and health impairment.** An over reliance on CCS and DAC results from unrealistic estimates of their net costs, actual effectiveness, and probability of successful implementation. Overall CARB's unrealistic assumptions bias the overall assessment in favor of proposed Alternative 3 compared to Alternatives 1 and 2.

Table 2-2 below shows that for ALL the scenarios that CARB sets up and evaluates, refineries will continue in production using CCS and will produce biofuels [for transportation, buildings and industry] that receive Low Carbon Fuel subsidies. Below we explain why this is not a low-cost, timely, or effective way to reduce local air pollution or greenhouse gas emissions to meet California's required emissions goals.

Extract of **Table 2-2 Actions for the Proposed Scenario** (p 58) Illustrating Continued Fossil Fuel and Biofuel uses

Sector	Action	Statutes, Executive Orders, Outcome
Oil & Gas Extraction	Phase out operations by 2045	Reduce GHGs and improve air quality AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Petroleum Refining	CCS on majority of operations by 2030 Production reduced in line with petroleum demand	Reduce GHGs and improve air quality AB 197: direct emissions reductions

Low Carbon Fuels for Transportation	Biomass supply used to produce conventional and advanced biofuels, as well as hydrogen	Reduce demand for petroleum fuel and GHGs, and improve air quality AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Low Carbon Fuels for Buildings and Industry	In 2030s renewable natural gas (RNG) blended in pipeline Renewable hydrogen blended in natural gas pipeline at 7% energy (~20% by volume), ramping up between 2030 and 2040 In 2030s, dedicated hydrogen pipelines constructed to serve certain industrial clusters	Reduce demand for fossil energy and GHGs, and improve air quality AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

CARB's unrealistic and biased approach follows a history of national policymaking that relies on unproven technological innovations to sustain economic growth rather than support policies that reduce emissions and transform the economy and consumer behavior, which are estimated to have higher costs even if the long-run social costs are lower than the chosen approach. Technological promises with poorly understood impacts and resource demands have been used to formulate cost-optimizing models, and then the technology becomes integral to framing the policies.[1]

The public has not been provided the information required to evaluate the models used by CARB to assess the relative benefits and costs of specific policies to meet climate goals. The use of the proprietary model IMPLAN, which is based on specific assumptions that may not be applicable to the scenarios, results in a method that is not transparent and not replicable.[2] For example, PATHWAYS assumes that increased costs result in lower household spending, which is then used for the direct cost input into IMPLAN and results in higher induced reductions in state output and employment.[3]

The additional IMPLAN is a static model, so the reduction in a specific industry's contribution to output and jobs is permanent and not replaced by expansion of other industries. This approach is incorrect because California is a dynamic, innovative economy that is continually growing and changing. These assumptions bias the reduction in household spending and cause the decline in output and employment, especially for Alternative 1.

The public must understand how IMPLAN integrates the growth of the California economy, including the green economy, as the fossil fuel industry is phased out. In the draft scoping plan, however, this is unclear and needs to be made explicit. The presentation of results are misleading. For example, here are the cost results provided by E3.[4] The graphs and charts mostly compare the four scenarios to each other. However, the costs identified by the scenarios do not differ very much when considered in comparison to the economy as a whole, as shown in this example.

Overall, the presentations seemed to be geared toward making a case for the alternative selected by CARB rather than providing a straightforward and objective presentation of the detailed data, which would have provided a comparison of results and uncertainties.

With the proposed scenario that relies on proprietary modeling of policy options that achieve far fewer emission reductions than other states are already pursuing, CARB passes off the mantle of climate leadership to the states of Washington (which requires emission reductions of at least 95 percent by 2050) and New York (which requires emission reductions of at least 85 percent by 2050).

The estimated economic and health results presented in the draft CARB Scoping Plan and workshops are highly aggregated and provided without any acknowledgement of the range of uncertainty, as if they were calculated values from a proven method with [near] certainty. This misleading presentation does not allow the public to evaluate the results in any meaningful way. The assumptions and data used by the CARB contractors are required to evaluate the modeling. CARB continues to withhold this information, and supposedly will release the detailed reports by E3, Rhodium, and UC Irvin with the final CARB scoping plan. This is TOO LATE and makes a mockery of "public review" and prevents meaningful engagement.[5]

Output and Employment Analysis

CARB draft scoping plan (May 2022), appendix H, provides technical support documentation for the modeling analysis of the AB 32 GHG Inventory sectors. CARB states, "The Proposed Scenario and alternatives are not forecasts. They are projections of the level of GHG emission reductions that may be achieved through combinations of actions that occur between the present and 2045. The level of stringency and timing of these actions dictates the potential GHG emissions reductions. As with all projections, there will be uncertainty associated with any point estimates." (p 1) The draft acknowledges "Model outputs and results are contingent on key assumptions, limitations of data sets, and model capability" (p1).

However these limiting characteristics of the modeling and evaluations are then forgotten, and CARB even implies that the modeling is adequately described in reports and workshop presentations by E3 and Rhodium:

- Energy and Environmental Economics (E3) used the California PATHWAYS model to represent fuel and technology choices on GHG emission reductions. The data sources and modeling assumptions used in the PATHWAYS model are listed here. The Reference Scenario assumptions are also included.
    - In fact, no description of actual assumptions, data, or model in the tables are provided. The text sends you to the section on Modeling (p 2) , which sends you to https://www.ethree.com/tools/pathways-model/; which sends you to "tools" that you can contract for use, https://www.ethree.com/tools/ This runaround replaces transparency with confusion, and does not allow an adequate public review process.
- Rhodium Group used the PATHWAYS energy system costs, fuel demand and efficiency savings as inputs into IMPLAN to evaluate the effect the alternative scenarios would have on the California economy in terms of Gross State Product, employment, and household expenditures.

To conduct their analysis, Rhodium relied on cost data from E3's proprietary PATHWAYS model as an input to the proprietary macroeconomic model IMPLAN. PATHWAYS models the direct cost data estimates on expenditures, by sector, for each alternative relative to the Reference Scenario. The incremental changes in spending are then input into IMPLAN to estimate the overall impact of achieving carbon neutrality on the California economy [in 2035 and 2045], including the indirect and induced effects of economic activity across linked regions. (p 86) The section on modeling is referred to several times, e.g. "The assumptions and references for the costs were summarized in the Energy and Emissions Modeling section of the appendix. These direct costs are inputs to IMPLAN across the various economic sectors and households." However the summary provided is inadequate because the underlying assumptions and data are hidden in nontransparent proprietary models and cannot be replicated or evaluated by the public. These models focus on economic costs, primarily the impact on output and employment, and ignore the health benefits and other social benefits for both current and future generations.

Also the assumptions about the direct costs being borne by consumers and about the high stock costs from phasing out equipment (e.g. ICE vehicles, gas furnaces) and infrastructure (e.g. natural gas pipes) are biased against Alternatives 1 and 2, while the large government subsidies paid for carbon capture and "low carbon" biofuels are ignored as costs, which biases the use of carbon capture. For example, here are the four categories of direct costs in PATHWAYS (p 88):

- Cost of Carbon Dioxide Removal (CDR): paid by consumers
- Cost of purchasing capital stock [retiring cars, heaters, etc. before end of life]; paid by consumers
- Cost and saving from changing fuel expenditures: cost not passed on to consumers
- Demand change measure cost or the cost of energy efficiency measures across sectors: costs to industry for equipment passed on to consumers

The costs to consumers are assigned evenly across all household income groups, which is regressive because lower income households pay a higher proportion of their incomes.

We note that caveats are given in the discussion of health benefits, but not in other modeling sections. Caveats should be provided for all models. For example, within the IMPLAN model, displaced workers are not assumed to relocate to other industries, and more broadly, general equilibrium effects are not modeled in this static model. Production functions and the state of technology are also assumed to be constant.[6] The increase in specific industries and the decline in specific industries from the scenario assumptions are inputs, but what these are and how they are treated is not provided. Overall we are not able to evaluate the economic impact of the scenarios without more information, and we are concerned that the *assumed* direct costs to consumers results in *over*estimating the reduction in output and employment, especially from the decreased in induced spending, i.e., from the income spent by the direct and indirect workers. For the same reasons, we suspect that the economic costs of phasing out of the production of oil and gas are overstated because as the oil industries are phased out, they will be replaced by other economic activities, and the change in state output should be assumed not to be affected across scenarios.

<u>No new investments in fossil fuel activities</u>

The IEA (International Energy Agency) provides the global data on oil, gas, and coal that is used by scientists and policymakers. The IEA roadmap to net zero by 2050 includes "no investment in new fossil fuel supply projects, and no further final investment decisions for new unabated coal plants. By 2035, there are no sales of new internal combustion engine passenger cars, and by 2040, the global electricity sector has already reached net-zero emissions."[7] CARB's proposed scoping plan goes against this IEA mandate, and even includes the equivalent of building of 33 new fossil gas plants. Also new investments in refineries and infrastructure that are used for the building of blue hydrogen instead of green hydrogen, used to capture CO2 for extraction of oil and gas or for production of "low carbon" petrochemicals are fossil fuel

investments that should be used instead to transform the economy to a modern, carbon neutral, environmentally just economy by 2045 or earlier.

Phasing out of extraction and refining of petrochemicals

The scoping plans Alt 3 and 4 include phasing out extraction of oil and gas in California, but they allow refineries to continue producing petrochemicals to service the assumed high demand for gasoline, diesel, and aviation fuel, and for the refineries to produce biofuels and other "renewable" fuels indefinitely with the use of carbon capture and storage. These two scenarios ensure that California will continue to pollute vulnerable communities living near refineries, as well as other heavy emission sources both stationary and mobile.

CARB must include in its scoping plans the phasing out of oil refineries by 2045 without relying on CCS and must also ensure that refineries do not increase oil exports (both domestic and foreign) as California reduces the demand for oil.

Furthermore, CARB's assumption that refineries will install CCS on most of their operations by 2030 is unrealistic and misleading. The refineries do not want to install expensive CCS equipment on each smokestack, and then have to sequester it safely.[8] As part of their business strategy to lower the carbon intensity of output, refineries want to produce "blue" hydrogen, which is gray hydrogen using fossil gas with CCS. However production of hydrogen requires much more fossil gas energy compared to refining crude oil. Also, CCS would only capture CO2, leaving other toxic emissions to be released into the community; local air pollution can *worsen*.

Refineries also want to produce biofuels ("renewable fuels") using "blue" hydrogen, which is profitable because of the Federal Q-45 subsidy and the state's LCFS subsidy. In the economic evaluation of proposed scenarios, the tax subsidies must be included in the costs for renewable fuels, carbon sequestration, and any other process receiving a subsidy. However, CARB ignores the subsidies as if they are "free", although tax dollars are used to dramatically reduce the industry's costs of producing renewable fuels and using carbon capture. In many cases the subsidies for CO2 removal are more than the actual costs to the company. The Federal tax subsidy Q45 was $32 per ton in 2020 and increases to $50 per ton in 2026[9]. The California Low Carbon Fuel Standard credits, which are applied to transportation fuels, had an average price of $150-$200 for a metric ton of reduced carbon dioxide, and a price of $199 per ton in Jan 2021[10]. Together the subsidies for CO2 emissions reduction with CCS or DAC or producing biofuels can total up to $250 per metric ton, which is an extremely expensive subsidy to industry that is unjustified when much lower cost, more effective methods for reducing greenhouse gas emissions by using renewable energy and by increasing natural sequestration of carbon are available. California should focus on funding a rapid

transition to using renewable energy in place of oil and gas and to using natural carbon sequestration.

The life cycle of biofuels have two major problems: competition with land to grow food or forests, and GHG emissions in their supply chain and operations, including toxic local air pollution. Taxpayers will end up paying for blue hydrogen and biofuels with both their taxes and their health. To be considered using clean energy, refineries must be required to use “green” hydrogen in their refinery operations, because green hydrogen uses renewable energy such as nearby solar or wind. Specific requirements of the feedstock for biofuels must ensure that production is restricted to waste feedstocks.

Sequestration of Carbon

Instead of enacting policies that focus on large reductions in GHG emissions, such as ending the use of ICE vehicles and replacing fossil gas use in buildings and homes with clean electricity, CARB’s proposed scenario *allows large greenhouse gas emissions* and then assumes California can *use unproven, expensive carbon capture and sequestration (CCS) and direct air capture (DAC) to meet its climate goals* that require much lower GHG emissions.

CARB’s assumptions about CCS capturing 90% of CO2 are not realistic because actual operations capture much lower levels of CO2 over time. CARB’s assumptions about natural carbon sequestration are also biased because CARB assumes very low natural carbon sequestration from wetlands, peatlands, and land management coupled with high carbon emissions from wildfires, which together result in natural and working lands being net carbon *emitters* over the next decades. These assumed net negative Natural Working Land emissions require even *higher* levels of engineered carbon sequestration. [See the appendix on Natural Working Lands below.]

Economic Analysis Summary

To provide the timely and ambitious scoping plan that California needs, the CARB staff must conduct an evaluation of a new or revised scenario based on realistic assumptions that do not bias the underlying costs and benefits in certain directions and are then used to justify delaying required emissions reductions. The uncertainty associated with specific assumptions can be evaluated by calculating a sensitivity test using realistic upper and lower bounds. In addition, the process must include EJAC in the setting up the scenario in a model that integrates air pollution and other impacts on vulnerable communities as part of the scenario.

There are specific policies that can move state towards specific goals without using unproven technologies, and we have focused on these in this document: phase out

extraction and refining of oil and gas products, greatly expand and invest in natural working lands programs, electrify buildings, integrate public and shared transit and active transportation along with EV vehicles and charging infrastructure; plan for expansion of GREEN hydrogen for use in hard to decarbonize industries such as cement, ships, long haul; and subsidize electrification of buildings, vehicles and transit, especially in low-income communities, instead of subsidizing rich industries such as oil and gas. Current subsidies for the oil industry can be used in funding the phasing out of the fossil fuel industry by supporting local community development and workers moving to good jobs.

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[1] Duncan McLaren and Nils Markusson “The co-evolution of technological promises, modelling, policies and climate change targets” Nature Climate Change | VOL 10 | May 2020 | 392–397 | www.nature.com/natureclimatechange.

[2] The IMPLAN assumptions may not be applicable to the CARB alternatives, and the IMPLAN model has other potential biases, as IMPLAN online report points out.

[3] Source: The costs of DAC, of cost of demand change, the cost of stock is passed through to consumers, reducing household spending. Slide 6, Rhodium presentation.

[4] Amy Kyle provided the material for this example, which uses the E3 graph with the CA GDP added for comparison.

[5] In an email to an author of Rhodium report, Brown was told the final report would be released with the final CARB Scoping Plan.

[6]https://support.implan.com/hc/en-us/articles/115009505587-Detailed-Key-Assumptions-of-IMPLAN-Input-Output-Analysis

[7] *Net Zero by 2050: a Roadmap for the Global Energy Sector* https://www.iea.org/news/pathway-to-critical-and-formidable-goal-of-net-zero-emissions-by-2050-is-narrow-but-brings-huge-benefits

[8] For an example that CCS is expensive and does not work, see https://ieefa.org/wp-content/uploads/2022/03/Gorgon-Carbon-Capture-and-Storage_The-Sting-in-the-Tail_April-2022.pdf. This documents the Gorgon project in Western Australia, which is owned by Shell, Exxon, and Chevron and began operations in 2016. The Gorgon CCS project has failed to deliver, underperforming its targets for the first five years by about 50%. However, this plant is cited as a successful CCS project in the reference in footnote 112 of the Scoping Plan.

[9]https://sgp.fas.org/crs/misc/IF11455.pdf The Q45 subsidy for CCS used for oil extraction is slightly less.

[10]https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard/lcfs-credit-generation-opportunities

APPENDIX 3–Natural and Working Lands

We acknowledge the tremendous work the CARB staff has done by including modeling and estimates of carbon emissions and sequestration for Natural and Working Lands (NWL) in this year's Scoping Plan for the first time.

We recognize that California's natural and working lands are not as healthy as they need to be to achieve California's climate and other goals, and that these valuable resources need effective intervention immediately. As noted in the draft Scoping Plan: " *California's NWL assessments highlight the importance of increasing the pace and scale of NWL actions to ensure that our ecosystems are better equipped to withstand future climate change so they continue to provide the benefits that nature and society depend upon for survival.* (CARB, *Draft 2022 Scoping Plan Update*, May 10, 2022, p 70)

That being said, we strongly question the conclusion that California's NWL will be net carbon source until 2045:
"The expanded modeling conducted for this Scoping Plan shows that NWL are projected to be a net source of emissions through 2045 and indicates a probable decrease of carbon stocks into the future." CARB, *Draft 2022 Scoping Plan Update*, May 10, 2022, p 70)

We recognize the large variability in the capacity of different natural systems to capture and sequester carbon. We also recognize the debate over the best ways to measure the effectiveness and duration of nature-based systems to capture, transform, and sequester carbon. However, CARB's estimates are at extreme odds with a number of well-regarded, recent research reports that are summarized below

Reference	**Potential Cumulative GHG emissions reductions**	**Where do reductions come from**	**Comments re study**
Cameron, et al., Proceedings of the National Academy of Sciences – *Ecosystem Management and Land Conservation can Substantially Contribute to CA's Climate Mitigation Goals, 2017.*	Cumulative By 2030 147 MMTCO2e (million metrics tons of CO2 equivalents) cumulative 17.4% of cumulative reductions needed to meet state goals ('ambitious' scenario) Annual reductions as high as 17.9 MMTCO2e (ambitious scenario) or 13.4% of 2030 reduction goal	Most reductions come from changes in Forest management reforestation, avoided conversion, compost amendments to grasslands and wetland and grassland restoration	The analysis does not incorporate the full scope of potential land-based mitigation activities, especially those in agricultural lands. This study focused extensively on forests
LLNL, *Getting to Neutral: Options for Negative Carbon*	25.5 million tons of CO2e annually by 2045	Reforestation, changes to forest mgt; restoration of tidal marshes, freshwater wetlands	LLNL study relied heavily on forest management work

Emissions in CA, August 2020		and grasslands, and soil carbon sequestration practices, e.g. soil improvement	by Cameron et al. cited above.
The Nature Conservancy of California, *Nature-Based Climate Solutions*, 2020	514 million metric tons of carbon dioxide equivalent (MMT CO2 e), through 2050. (assume optimized conditions)	Study outlines 13 actions across all sectors over 28 million acres (ag, forestry, wetlands, riparian, urban, that can, with strategic policies and investments, reduce cumulative net greenhouse gas emissions	
The Climate Center *Setting an Ambitious Sequestration Goal for CA's Working Lands: Analysis and Recommendations for Net-Negative Emissions by 2030*, January 2022	Cumulatively 289 MMTCO2e by 2030 in working lands and some urban lands 103 MMTCO2e annually after 2030. Assumes optimized, best-case conditions.	Cropland, pasture, range, avoid Nitrogen fertilizer, agroforestry, prescribed grazing riparian restoration and roadside buffers. This includes 20.4 million acres of arable land, 3.5 million acres of rangelands; 50% of state's 400K miles of highway rights of way and one million acres of riparian area.	Study focused on arable working lands. Not forests

These reports all point out that California's NWL can be net carbon sinks well before 2045 from:

- restoration of soils/habitats that have become carbon emitters;
- conservation/mitigation and enhancement of soils/habitats that are currently carbon sinks;
- non-conversion of natural soils/habitats that are carbon sinks; and,
- on-going correct management.

The estimates by Lawrence Livermore National Lab, (LLNL) are the most conservative of the above studies but LLNL still found that NWL could sequester 25.5 million tons of CO2e annually by 2045.

In contrast, two studies targeted a 2030 end date. The Cameron et. al study in the prestigious Proceedings of the National Academy of Science, concluded that NWL could sequester 147 MMTCO2e cumulatively by 2030 with annual reductions as high as 17.9 MMTCO2e. The Climate Center (TCC) study concluded that by 2030 the state's NWL , if restored and/or conserved to their natural ability to capture and store carbon, could sequester 289 MMTCO2e cumulatively by 2030 and 103 MMTCO2e annually after 2030. We note that these two studies focus on very different types of NWL, yet both studies concluded that NWL have the capacity to sequester a significant amount of CO2 by 2030.

The Nature Conservancy's timeline was the farthest out and found that NWL could sequester 514 million metric tons of carbon dioxide equivalent (MMT CO2 e), through 2050.

Overall the studies provide evidence that NWL can provide an important source of carbon sequestration in reaching California's emission reduction goals. In stark contrast, CARB's draft Scoping Plan states NWL will be a net emission source through 2045. These studies demonstrate that the models and assumptions used by CARB to estimate the carbon capture and sequestration potential of NWL resulted in substantial underestimation of the potential role of NWL, and could significantly penalize funding for NWL restoration and result in billions of dollars being spent on carbon removal technologies (CRT) perceived as "silver bullets," but that are in fact economic and technological dead-ends

Modeling Inaccuracies and Gaps

Wildfire Emissions Modeling Results presented in the Scoping Plan draft Overestimate Forest Wildfire Emissions

In letters to CARB (2/26/21 and 5/3/22), and shared with 350 Bay Area, the Center for Biological Diversity outlined a number of concerns with the models used to develop NWL forest wildfire emission data. These data have a significant impact on the draft Scoping Plan NWL sequestration estimates. We are specifically concerned with the use of the FOFEM and LANDFIRE models. As stated in the letter:

> "Research clearly shows that models like FOFEM and LANDFIRE, which are central to the draft report's estimation of wildfire emissions, substantially over-estimate wildfire emissions by using unrealistic biomass combustion factors and under-representing the biomass stored in standing dead trees after fire. Stenzel et al. (2019) highlighted that these models overestimate the wildfire emissions from California's forests by three-to-four times that of actual field-based values…"

Chad Hanson, in his book *Smokescreen*, cites studies showing that only 1 - 4% of sequestered carbon in a forest is lost in a wildfire (page 83). The real loss comes when logging is permitted after the fire, which does eliminate most of the carbon.

CBD goes on to list a number of recommendations including that CARB correct for these incorrect estimates by using empirical field data of forest carbon consumption based on actual wildfires. **We strongly urge CARB to review and update models used for this sector.**

Agricultural Land Scenarios are Limited and Underrepresented

While we commend CARB for including a target of 20% organic acreage for agricultural cropland by 2045 we strongly encourage that this be increased to a target of 30% of cropland using organic farming by 2030.

The Carbon Cycle Institute, in a letter to CARB dated 3/22/22, shared its concerns with CARB's NWL modeling especially with regard to agricultural lands. They detailed a number of technical modeling concerns, including one very basic concern. According to CCI arable rangelands were not specifically considered in the Scoping Plan model, (NB-

Appendix I NWL Technical doc: Page 23) even though rangelands, when managed through the strategic application of compost, have shown strong potential for soil carbon storage, " (Silver et al., 2018).

The minimization of the potential of agricultural lands in helping California meet its GHG reduction goals is a major missed opportunity.

All Coastal Wetlands in California should be included

We applaud CARB's recommendation outlined in the draft Scoping Plan to restore 60,000 acres of wetlands in the Sacramento-San Joaquin River Delta. This is a starting point. We urge CARB to expand this recommendation to include all of California's coastal wetlands. These 'blue carbon' habitats are estimated to store 13.4 million metric tons of carbon annually.

The inclusion of all California's coastal wetlands along with a more inclusive approach to agricultural lands would strengthen the draft Scoping Plan model with regard to NWL.

Co-Benefits and Remarkably low Remediation/management costs

It is obvious that questions exist around the degree to which NWL capture and store Carbon. However, there is no question about the co-benefits provided by healthy NWL.

In addition to storing, transforming, and retaining carbon, Natural and Working lands are sanctuaries for people and wildlife that improve water and air quality, increase soil health and food yields, reduce food insecurity, impede erosion, create wildlife habitat, and save homes and communities. The Nature Conservancy estimates that restored NWL in California could save more than $24 billion in damages by 2050. (The Nature Conservancy of California, *Nature-Based Climate Solutions – Roadmap*)

Natural and Working Lands are a remarkably low-cost solution to climate change. The average cost over multiple sectors of implementing the suite of activities necessary to achieve and maintain healthy NWL is extremely low. **LLNL estimates the cost at $11/ton of CO2 removed from the atmosphere** (LLNL – *Getting to Neutral: Options for Negative Carbon Emissions in CA,* page 19*).* Since the technologies used for NWL are known, tested, and require no time-to-development, they can be implemented immediately.

In contrast, the same LLNL study estimates that implementing Direct Air Capture (DAC), would have a 'near term cost of roughly $230 - $266 per ton CO2 removed" depending on the DAC process used. (NB: These are not start-up costs rather they are overall facility construction and maintenance costs amortized over a 10 year plant lifetime and a discount rate of 12.5%., LLNL – *Getting to Neutral: Options for Negative Carbon Emissions in CA,* pages 77-80.). However, the study noted **that the cost today of Direct Air Capture (DAC) is roughly $600 per ton of CO2 removed.**

We acknowledge that the modeling of any natural system is fraught with difficulty because they are dynamic, highly variable systems. That being said, the models currently used in the draft Scoping Plan to estimate NWL GHG/Carbon emissions and storage are based on questionable assumptions, and the biased results will lead California to make faulty choices.

Nature-Based systems can be the primary system for carbon drawdown and retention (capture, transformation, and sequestration) if supported and funded appropriately, immediately, and over the long-term. They should not be secondary or adjunct to engineered systems that are still ineffective after 25+ years of research and billions of dollars in lost investments.

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(Draft Scoping Plan: Appendix I NWL Technical doc: Page 23
Rangelands receive the vast majority of easements from the Department of Conservation at 11,748 acres annually. Rangelands, however, are considered in our forest, shrublands, and grasslands modeling, and does not include land use change, therefore, rangelands are 100% conserved in all of our scenarios.
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APPENDIX 4–Energy sector – Distributed Energy Resources (DER)

The benefits of Distributed Energy Resources, including affordability, accelerating clean energy targets, public health, resiliency, and land use are inadequately represented in CARB's draft Scoping Plan and in related state agency planning and implementation.

The energy sector has been the primary source of California's success in decreasing emissions over the past 10 years. However, modeling from the CEC recognizes that we need to markedly accelerate construction of new renewable energy sources, especially in the face of building and transportation electrification. DERs play a crucial role in accelerating renewable energy. For example, over the past 5 years (2017 to 2021) California has deployed 8.1 gigawatts-dc of utility scale solar photovoltaics and 8.4 gigawatts -dc of solar photovoltaics on the distribution grid. To emphasize, installation of solar photovoltaics, one of the suite of DER, has represented more than half of the new solar photovoltaic installations in California. Of that distributed generation, 64.2% is residential behind the meter. (Data source: Interconnected Project Sites Data Set[1])

Meeting our growing transportation and building electrification targets also requires affordable electricity. Two independent modeling studies and analyses show that optimizing distributed energy resources (i.e. energy efficiency, storage, solar and flexible load management on the distribution grid) **consistently results in decreasing electricity rates over time** compared to meeting clean energy goals by investments in utility scale PV—in part by avoiding enormous investments in transmission infrastructure. The VCE study[2], for example, shows that California saves $120 billion dollars by optimizing DER.

Of crucial importance, current modeling on which California Integrated Resource Planning is based **does not have the capacity to model optimized distributed energy resources** to assess the least cost route to meet California's climate goals. Specifically RESOLVE, used in CPUC and CARB models, can only optimize for utility scale resources without differentiating between generation (such as PV or storage) located on the distribution grid versus those requiring transmission. Models need to optimize all three scales and locational categories of resources - those larger than 20 MW connected to the transmission system, those up to 20 MW connected directly to the distribution system, and the millions of resources typically below 1 MW sited behind the meter (BTM) on customer premises, including distributed generation (DG), storage, and demand response.

We strongly urge that the modeling also include monetized values for land use. In addition to saving money, policies which optimize DER will decrease disruptions to NWL carbon sequestration caused by new transmission corridors and utility scale solar

installations, e.g. in deserts. Furthermore CARB planning should be consistent with the governor's initiative to conserve 30% of California's lands by 2030. Ignoring the land use benefits of DER is substantially contrary to conservation objectives.

[1]https://www.californiadgstats.ca.gov/downloads/#:~:text=The%20Interconnected%20Project%20Sites%20Data,including%20those%20that%20are%20decommissioned.

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