



June 24, 2022

Governor Gavin Newsom
1021 O Street, Suite 9000
Sacramento, CA 95814

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

What Can California Do to Prevent Global Warming Greater than 1.5°C?

Dear Governor Newsom and Chair Randolph:

350 Humboldt, 350 Silicon Valley, and allies signing on to this letter representing more than 20,000 supporters throughout California, are pleased to submit these comments in response to the draft Scoping Plan released on May 11, 2022.

The draft Scoping Plan is a remarkable document. It is clear, easy to read, logical, and full of proposed policies that will take us toward our climate goals. It embodies a massive amount of modeling and analysis. It recognizes the existential threat of climate change including the potential loss of \$14.5 trillion in costs to the United States economy alone over the next 50 years, as well as the overwhelming threat to the health and well-being of poor and minority communities from the continued development and use of fossil fuels. It also presents evidence (in Figure 1.1) that California has reduced emissions since the year 2000: Despite large population and economic growth, emissions are about 10 percent lower in 2019 than in 2000.

The draft contains a good summary of the Intergovernmental Panel on Climate Change's (IPCC's) current projections. It recognizes that for some purposes, technologies that are barely developed at this point—green hydrogen and direct carbon capture—are likely to be important for decarbonizing some industries late in our efforts. For the first time, this draft incorporates consideration of our natural and working lands and the need to sequester more carbon even as we drastically reduce carbon emissions. Finally, it commits California to a path to net-neutrality by 2045. In that way it recognizes that our state has contributed far more to the problem of global warming over the last two hundred years than most areas of the world—not only through our massive use of fossil fuels, but by turning 95 percent of the significant carbon sequestration potential of our old-growth redwood forests into tree farms that are cut before they come close to matching the climate benefit of what was there before.

Nonetheless, the poorly conceived alternative scenarios in the draft scoping plan do not give us an adequate plan and approach for the crucial next eight years. *Why eight years?*

- According to the IPCC, the “carbon budget” that can be emitted without exceeding a global average of 1.5°C will be used up within that time unless changes are made now.
- Right now, we have an unparalleled opportunity to slow the pace of warming by reducing methane, HFC refrigerants, and black soot—but that opportunity requires drastic reductions by 2030.

Because the draft plan contains so much information, the Board has the option to adopt a version of the Scoping Plan that will take full advantage of our eight-year window for action—by changing just four essential goals and moving milestones forward in time; or by modifying and selecting Alternative 1. The rationale for the recommendations is provided after the recommendations themselves.

With our comments we hope to convince CARB Board members to direct staff to modify the draft plan so that we move much faster than we have been moving—and *faster than the current draft plan projects between now and 2030*. If other states and countries follow California's lead, it will make all the difference between a mostly livable planet and a mostly unlivable planet in the decades ahead.

Because the climate crisis is a worldwide catastrophe unlike any other that the earth has seen during the presence of humans, key decision makers who are in a position to dramatically affect the consequences of climate change—including CARB Board members and the Environmental Justice Advisory Committee—are literally the most powerful persons in the history of humanity. Tipping points occur in the political response to climate change too, not just in physical phenomena. *The CARB Board's decision on the basic framework for the Scoping Plan could well be a tipping point in addressing the climate emergency.*¹ This is why the argument that California's emissions are just a small fraction of the global emissions that must be reduced is a dangerous and cynical fallacy.

Finally, we must address the issue of cost—to the California budget and the economy overall—of instituting the changes that must be made within the next decade. We recognize that in an election year, and during an apparent economic downturn, it seems politically unpalatable to advocate for any major change in the short term. But we remind you that the cost of inaction, or even of insufficient action, at this late date will be far greater: in human suffering, in catastrophic and irreversible changes to the environment, and to governments at every level that will be called on to make our people whole and our lives livable. That is the responsibility of government. And therefore the imperative is to take bold action now to avert the worst consequences of the climate emergency.

¹ Frances C. Moore, et al. "Determinants of emissions pathways in the coupled climate–social system." *Nature* 603, no. 7899 (2022): 103–111. <https://www.nature.com/articles/s41586-022-04423-8> Quote: “The ambition and effectiveness of climate policies will be essential in determining greenhouse gas emissions and, as a consequence, the scale of climate change impacts. However, the socio-political-technical processes that will determine climate policy and emissions trajectories are treated as exogenous in almost all climate change modelling....An analysis of model behaviour reveals the potential for nonlinearities and tipping points that are particularly associated with connections across the individual, community, national and global scales represented. These connections can be decisive for determining policy and emissions outcomes.”

Thank you for considering these comments.

Sincerely yours,

Daniel Chandler, Ph.D.
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350 Silicon Valley

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I. RECOMMENDATIONS: TWO ALTERNATIVE APPROACHES TO MAKING THE DRAFT PLAN MORE ADEQUATE TO THE NEED

A. Adopt and adhere to four priorities.

These are generally consistent with Scenario 1, but do not include the unrealistic assumption that net-zero can be reached by 2035. Below is a summary of the priority goals.

1) **Drastically reduce short-lived climate pollutants:**

- Reduce HFC emissions by 80 percent by 2030.
- Reduce landfill and agricultural methane emissions by 50-75 percent by 2030.
- Reduce oil/gas methane emissions by 80 percent by 2030.

2) **Transition to renewable electricity:** Speed up the renewable electricity requirements of SB 100 from 60 percent to 100 percent in 2030. The International Energy Agency says all countries need to be at 100 percent by 2035 and President Biden's plan also is for 100 percent by 2035.² Since California is considerably ahead of the world and most other states, our goal should be 100 percent by 2030.

The 2021 *SB 100 Joint Agency Report* modeled achieving 100 percent renewable energy in 2030 and deemed it feasible. The added cost for 100 percent is about \$5 billion by 2030. There are some added costs over the next 15 years as well, because the system not only converts to 100 percent renewable electricity, but expands capacity by three times to meet growth.³

Note, however, that choosing 2030 also maximizes the health benefits of eliminating fossil pollution from power plants, which will more than pay for the mitigation costs.

- #### 3) **Repair California's cap and trade program.** There are three issues with cap and trade. First, it doesn't permit regulation of air quality for covered entities. Second it appears to have too many free allowances and uncertain offsets. And third, the allowance price is too low. All of these together limit the capacity of cap and trade to achieve what the state counts on it for in achieving the SB 32 40 percent reduction in emissions. These issues can be addressed by increasing the 40 percent goal to 80 percent, and giving cap and trade a proportionate role. However, the cap and trade program also threatens air pollution and climate justice. It must be reformed so it does not give air polluters a free pass. If that is impossible, it should be abandoned for direct regulation.
- #### 4) **Decarbonize transportation.** The University of California Institute of Transportation study in 2021 analyzed all types of vehicles and fuels as well as vehicle miles traveled. They include a very low carbon strategy that results in 100 percent of both light-duty vehicle and trucks sold in the state being all-electric by 2035. The draft plan uses this date for light-duty vehicles but not for trucks. While this pathway has a cost above business as usual in 2030 of \$12 billion, it reduces costs by \$191 billion between 2030 and 2045.⁴ It is important to try to accelerate the timetable of

² IEA, Pathway to critical and formidable goal of net-zero emissions by 2050 is narrow but brings huge benefits (May 18, 2021), <https://www.iea.org/news/pathway-to-critical-and-formidable-goal-of-net-zero-emissions-by-2050-is-narrow-but-brings-huge-benefits>. U.S. Whitehouse, President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target (April 22, 2021), <https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/>

³ There is a relatively short discussion on page 13 and 14 and Figure 10 shows costs for achieving 100% in 2030, 2035, 2040 and 2045. Most models retain some gas power plants for flexibility and stability. March 2021, CEC-200-2021-001, <https://efiling.energy.ca.gov/EFiling/GetFile.aspx?tn=237167&DocumentContentId=70349>

⁴ Institute of Transportation Studies, University of California, Driving California's Transportation Emissions to Zero, 2021. Report No.: UC-ITS-2020-65. DOI: 10.7922/G2MC8X9X. <https://escholarship.org/uc/item/3np3p2t0>

this study as it only reduces emissions by 30 percent by 2030,⁵ although that is also a function of the percentage of renewable electricity available. Although only around 6 percent of the vehicle fleet is new each year, a much higher percentage of consumers lease vehicles or purchase used vehicles. Therefore it is important to get the initial sales of EVs as high as possible as quickly as possible so that the secondary sales are of used EVs. Rather than requiring all *new* light duty vehicle sales to be ZEV by 2035 as the Governor proposed, this date should be accelerated to 2025 and supported with relevant policies.⁶ With the very substantial savings over the business-as-usual scenario, we should also incentivize turning in older internal combustion vehicles prior to end of life.

B. Modify and select Alternative 1

A different approach is to start with Alternative 1 and remove the provisions that are most unrealistic and costly while strengthening the provisions that can be achieved by 2030, especially reductions of short-lived climate pollutants. Removing unrealistic actions would mean that reduction of some fossil emissions would not be achieved until well after 2035. Additionally, add in the cost benefits from fast phase-out of fossil pollution. The Health section of the draft plan analysis is perhaps the weakest; it completely underestimates the savings due to achieving a strong measure of environmental justice. As we will show, these savings more than balance the costs of decarbonizing.

II. RATIONALE OVERVIEW

Many of our leading climate scientists find the draft Scoping Plan dramatically lacking in ambition and even in logic. 350 Humboldt and 350 Silicon Valley wish to associate our comments with the critiques of Dr. Danny Cullenward and Dr. Daniel Kammen and colleagues, and incorporate them by reference. We also associate ourselves with the position of the Environmental Justice Advisory Committee that this plan fails low-income families and persons of color⁷ and with the May 3 comments of the coalition that includes the Clean Air Task Force and Environmental Investigation Agency.

We call on CARB in the strongest possible terms to adhere to the statutory requirements of AB 32 and SB 32, The Global Warming Solutions Act of 2006 and 2016, which set out the requirements for the Scoping Plan and its periodic updates; and to ensure that the final plan is closely aligned with, and is designed to meet the challenge of the United

⁵ Figure 4.26. Only 2030 and 2045 data are provided.

⁶ Institute of Transportation Studies, op.cit., p. 8. To accelerate the purchase and use of ZEVs, more and stronger policies are needed that:

- Increase the sales mandate on automakers on a pathway to rapidly move to 100% ZEV sales
- Encourage consumers to buy ZEVs, with both monetary and non-monetary incentives, including the possible use of revenue-neutral feebates that encourage sales of ZEVs
- Ensure that (subsidized) new and used electric vehicles are not leaving the state and that “used” gasoline and diesel vehicles are not being imported into California to circumvent ZEV policies
- Favor the purchase and use of ZEVs by underserved individuals and overburdened communities

⁷ Dr. Cullenward’s critique can be found at: <https://carbonplan.org/blog/scoping-plan-comments>. Dr. Kammen’s views are in this LA Times article <https://www.latimes.com/opinion/story/2022-05-17/california-air-resources-board-carbon-neutrality-2045-2030>, and in his letter, submitted to the Board with many colleagues. A scoping plan for California is set out by Dr. Kammen and other well-known colleagues in “Daniel M. Kammen et al., “Accelerating the timeline for climate action in California.” arXiv preprint arXiv:2103.07801 (2021). A comparison of positions of the draft Scoping Plan and EJAC’s views is found at: <https://caleja.org/wp-content/uploads/2022/05/CARB-draft-plan-vs-EJ-recommendations-FINAL-CORRECTED.pdf>

Nations Intergovernmental Panel on Climate Change (IPCC AR6) statement that to avoid catastrophic climate change, the world must limit global warming to 1.5°C.

Considering both the mandates of AB 32 and the predictions and recommendations of IPCC AR6, it is clear that the draft Plan falls far short of what is both required by law and needed for a habitable planet.

We ask the Board to instruct staff to revise the preferred alternative so that it puts as much effort and resources into the next eight to ten years as possible. “Net-zero” and “carbon neutrality” have devolved into greenwashing tropes repeated by major polluters and polluting countries that are dragging their feet. If California, a putative world leader in climate mitigation, frames its ambition in terms of “achieving carbon neutrality in 2045,” we will become complicit with the many other countries that are waffling on their voluntary nationally determined contributions.

If California does everything it can to accomplish what the IPCC AR6 Workgroup III on mitigation says is necessary to limit warming to 1.5°C, we can have a massive positive effect around the world.

III. AN ALTERNATIVE DECISION-MAKING FRAMEWORK FOR THE SCOPING PLAN

The focus on the concept of net-zero or carbon neutrality is the wrong goal for this scoping plan. The IPCC stated in its April 2022 report that we have approximately ten years to make very drastic reductions. Changes made later will be irrelevant for the 1.5°C goal. Therefore, we need to ensure that as much happens as is possible early on—long before 2035. This means maximizing greenhouse gas reductions by focusing on the most quickly and cheaply implemented interventions first, in order to buy time to develop the technology and the political will to undertake interventions that either seem far too expensive or are unproven today. Carbon neutrality is a goal that will be far easier to plan for and achieve after we have done the maximum that is technologically feasible in the next ten years.

Governor Brown’s Executive Order B-55-18 requires setting out steps to achieve carbon neutrality *at latest* by 2045. The scoping plan is opting for the least change consistent with the Executive Order. *More importantly, by 2045 the die will have been cast.* We will either still be at or below 1.5°C or we will have overshot to 2.0°C or 3.0°C or more. Our goal is 1.5°C, which means the critical time frame is 2030.

A. Rather than “net zero,” use AB 32 and the IPCC recommendations to structure the plan

In its focus on 2045, the draft Scoping Plan has strayed from its legal mandate and climate science. It does not comply with AB 32 (2006). State law, AB 32, requires California to *decarbonize at a speed that is “the maximum technologically feasible.”* The 2022 Intergovernmental Panel on Climate Change report (IPCC AR6) tells us *we need to decarbonize fast enough so as not to exceed 1.5°C of warming (2.7° Fahrenheit).* Operationally, this means decarbonize at maximum speed during the crucial next eight years. In short both the law and the science tell us we must move as *fast* as we can.

The plan does not comply with SB 32 (2016). The Global Warming Solutions Act of 2016 (SB 32) states: “The State Air Resources Board shall achieve the state’s more stringent greenhouse gas emission reductions in a manner that benefits the state’s most disadvantaged communities and is transparent and accountable to the public and the Legislature.” It also required “*at least 40 percent*” emissions reductions by 2030. By limiting our goal to 40 percent instead of the “maximum technologically feasible” and “most stringent greenhouse gas emissions” possible, the draft plan contravenes the intent of SB 32.

We are far from achieving even the 40 percent emission reduction. As Dr. Danny Cullenward explains, “for over a decade, emissions have been falling at an average rate of about 4 to 5 million tCO₂e per year, with a recent average of about 4.5 million tCO₂e per year from 2019 to 2021. To reach California’s legally

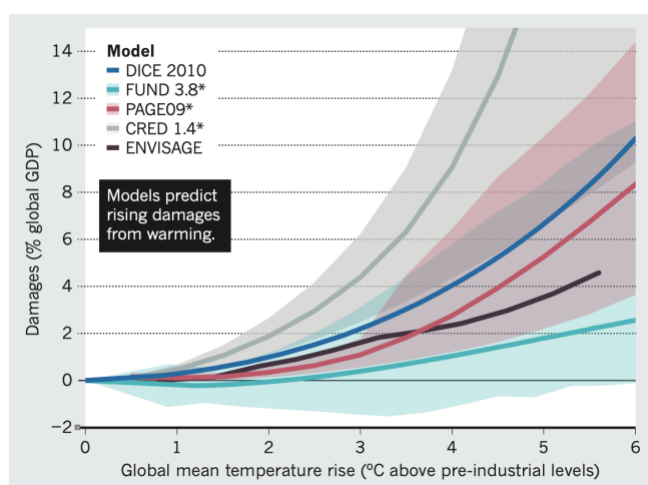
binding 2030 emissions limit (about 259 million tCO₂e per year), emissions would have to fall 16.7 million tCO₂e per year, or about 3.7 times as fast.⁸

We are even further from reaching the limited SB 1383 (2013) goals for reduction of methane and HFCs.

Reaching the agreed upon goal of 1.5°C, requires ambitious emissions reductions by 2030. President Biden has committed the United States to a 50 percent reduction in emissions over 2005 levels by 2030, in order to meet our Paris Accord pledge. However, California's legal minimum is only 40 percent reduction by 2030, and the draft Scoping Plan erroneously posits that we can achieve that goal without reforming the cap and trade program and *greatly* increasing the speed of decarbonization. Global warming is a global phenomenon that does not allow us to choose our own pace of decarbonization. California needs to set its decarbonization goals directly in line with the significant amount of the world's remaining 1.5°C carbon budget— which will be used up in eight years if the world continues at the same level of emissions.⁹

Emissions reductions must be “front-loaded.” Every year of delay before the world reverses the growth of emissions reduces by two years the time we have to reach net zero at or below 1.5°C.¹⁰ Making changes rapidly means that we will have options if, as has been happening with regularity, scientists discover that even the tight timeframe they have described requires further tightening. This is likely to happen if more methane than anticipated is released from melting permafrost, for example.¹¹ If we delay what can be done in the next decade, we will have fewer and worse choices if the science (or economy) changes.

Importantly, while temperature increases are linear, the damage done by climate change is not. This graph from *Nature* shows that the damage of 2.0°C and higher, compared to 1.5°C, is disproportionately greater. As emissions and temperatures rise, the rise in damage is almost exponential.



*Shaded regions indicate 5% and 95% confidence intervals for FUND 3.8 and PAGE09, and a high–low range for CRED 1.4.¹²

⁸ Cullenward critique (see footnote 7), p. 4

⁹ The amount of carbon we can still emit before passing 1.5°C is established by the IPCC at 500 GtCO₂ given a 50% likelihood of achieving that goal. If we want a 67% likelihood, the carbon budget goes down to 400 GtCO₂. “Global CO₂ emissions are about 36 billion tonnes per year, so 400 billion tonnes will last just 11 years if no reductions are made, i.e. the global carbon budget runs out at the end of 2030.” Summary of IPCC AR6 at: <https://www.carbonindependent.org/54.html>

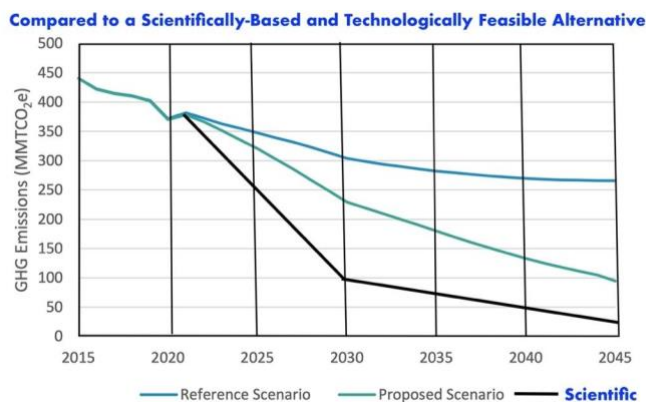
¹⁰ Nicholas J. Leach, et al. “Current level and rate of warming determine emissions budgets under ambitious mitigation.” *Nature Geoscience* 11, no. 8 (2018): 574–579.

¹¹ Sam Fankhauser et al. “The meaning of net zero and how to get it right.” *Nature Climate Change* 12, no. 1 (2022): 15–21.

¹² Richard L. Revesz et al. “Global warming: Improve economic models of climate change.” *Nature* 508, no. 7495 (2014): 173–175.

The scoping plan should provide a path to achieve 80 percent reduction in emissions by 2030. Daniel Kammen, Ph.D., former coordinating author of the Intergovernmental Panel on Climate Change and Professor of Sustainability at UC Berkeley, set out a scientifically backed and feasible program for California in 2021, which describes how to achieve an 80 percent reduction in emissions by 2030.¹³ In the graph below we have added this science-based path (the black line) compared to the draft plan's proposed and reference scenarios.

Draft Scoping Plan Figure 2-1: Reference and Proposed Scenario GHG Emissions (p. 57)



A science-based and technologically feasible reduction scenario that acknowledges the historic role of the US and California in greenhouse gas emissions and will be an example to other countries. It would reduce emissions by 80% by 2030 and 95% by 2045.

All four of the alternative scenarios in the draft are unrealistic. Alternatives 1 and 2 are based on reaching net-zero by 2035. There is nothing in the science presented by the IPCC that suggests that it is possible for an advanced industrial economy (with California's huge ICE fleet, massive amounts of air travel, and climate-caused wildfires releasing 112 million metric tons of carbon dioxide in 2020 alone) to get to net zero only 13 years from now—with or without carbon capture.¹⁴ Both of the 2045 scenarios are unrealistic because they rely on carbon capture for 20% of emissions. At this point experts differ widely on the 2050 potential of carbon capture and sequestration, direct air capture of carbon, bio energy with carbon capture and storage, and afforestation.¹⁵ CARB's own carbon-neutrality report cited increased risks from a slow rather than rapid decarbonization.¹⁶ The uncertainty has consequences: "Avoiding reliance on uncertain Carbon Dioxide Removal requires, in modelled scenarios, up to an additional 10GtCO₂e of emissions reductions by 2030. This considerable increase in global ambition is not captured by deterministic scenarios which fail to account for uncertainty in the feasible CDR potential."¹⁷ *In short, because the scalability of carbon capture for 2045 is in doubt, we must hedge by reducing more emissions now.*

The draft grossly underestimates the costs of not following the AB 32 requirement of maximum technologically feasible and stringent reductions in emissions. As the IPCC says: "If mitigation pathways

¹³ Kammen, et al., op.cit.).

¹⁴ Dr. Cullenward makes a similar point.

¹⁵ Neil Grant, et al., "The policy implications of an uncertain carbon dioxide removal potential." *Joule* 5, no. 10 (2021): 2593-2605.

¹⁶ "The High CDR scenario has the highest potential risks for local air quality, and implied health impacts, as well as climate change mitigation risk, while the Zero Carbon Energy scenario has the lowest risk for these two factors." Energy and Environmental Economics, Inc. Achieving Carbon Neutrality in California PATHWAYS Scenarios Developed for the California Air Resources Board, October 2020. https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf

¹⁷ Grant, et al., op. cit.

are not rapidly activated, much more expensive and complex adaptation measures will have to be taken to avoid the impacts of higher levels of global warming on the Earth system.”¹⁸ The draft Plan cites a figure from a January 2022 Deloitte study¹⁹ indicating climate change may cost the US \$15 trillion this century. Citing from the draft plan:

Over the past 50 years, the US has suffered a total of \$1.4 trillion in economic losses due to weather, climate, and water hazards....In 2021 alone, there were 20 separate billion-dollar weather and climate disasters in the US....If global average warming reaches around 3°C by century’s end, Deloitte’s analysis indicates that economic damages would grow and compound, affecting every industry and region in the country. Failing to take sufficient action could result in economic losses to the US economy of \$14.5 trillion (in present-value terms) over the next 50 years. In this climate-damaged future, the economy would lose nearly 4% of GDP—\$1.5 trillion in 2070 alone.

California is likely to suffer a disproportionate amount of these losses because of our susceptibility to wildfires, drought, sea level rise, zoonotic diseases, and pollution. Focusing on net-zero in 2045 instead of 2030 is actually a pretty sure way of reaching 3.0°C warming and the costs that will entail.

Specifically, the draft plan shows much higher costs in the short-term for Alternative 1 (net-zero by 2035) than the preferred alternative (net-zero by 2045). See Figure 3.2 on page 96 of the draft plan. However, the cost analysis in the draft plan has significant weaknesses and cannot be relied upon.

1. Alternative 1 is not feasible as drafted, so it is unsurprising that costs are high. For example, it assumes all existing fossil-based equipment would be replaced at one time rather than at end of life or some percentage of end of life. A more realistic plan would not incur many of those costs.
2. As noted above, costs for delayed decarbonization are not fully accounted for.
3. The incomplete health analysis does not come close to recognizing the financial benefits of reducing pollution quickly. See below for more detail.
4. By delaying decarbonization and having to fund large amounts of carbon capture, we forego the immense financial benefit (an estimated \$1.5 trillion in the US) from renewable energy innovation that is available with government incentives, including tax credits.²⁰

B. Reframing the Scoping Plan for environmental justice and long-term cost savings

Ethically, California is obligated to reduce emissions as much as possible by 2030. Historically, the US and California have put a disproportionate amount of CO₂ in the atmosphere. The US has 5 percent of the world’s population and emits 18 percent of the greenhouse gases. We are currently second only to lightly populated, mineral-rich Australia in per capita emissions. In 1900 the US and the 28 countries of Europe emitted 90 percent of emissions; in 1950 it was still 85 percent. Yet over our history, the US has emitted 20 percent of total emissions, almost twice that of the second biggest emitter, China.²¹ California emits

¹⁸ <https://www.ipcc.ch/sr15/cross-chapter-boxes/>

¹⁹ Deloitte, “The Turning Point: A New Economic Climate in the United States,” January 2022. <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/about-deloitte/us-the-turning-point-a-new-economic-climate-in-the-united-states-january-2022.pdf>

²⁰ A recent Rhodium Group and Energy Policy Institute study estimates \$1.5 trillion benefits from the tax credits in the stalled reconciliation bill. Benefits are 3-4 times the costs. “Assessing the Costs and Benefits of Clean Electricity Tax Credits.” https://epic.uchicago.edu/area-of-focus/assessing-the-costs-and-benefits-of-clean-electricity-tax-credits/#_ftn1

²¹ Our World in Data. <https://ourworldindata.org/co2-emissions>. US historical contribution from: David Wallace-Wells, May 24: https://messaging-custom-newsletters.nytimes.com/template/oakv2?productCode=DWW&te=1&nl=david-wallace-wells&emc=edit_dww_20220524&uri=nyt://newsletter/71f82874-6fe2-5287-932f-f921132e7f0b

399 million metric tons of CO₂ a year. Only oil-rich Texas emits more.²² It has been nearly fifty years since scientists made clear the warming effects of these emissions, so we cannot claim we are not responsible due to ignorance. Exxon knew for certain in the early 1980s.²³ The US Congress knew soon thereafter.

The fair allocation of the remaining carbon budget has been the subject of considerable study. In general, models take into account historical responsibility, capability of reductions, and equality. It is not fair to “grandfather” in all the historical emissions of advanced industrial countries, but very poor countries should get credit to bring them up to a common threshold of development. Although different fairness-based models have been proposed, they all result in the United States having to reduce far more than a simple allocation based on a worldwide per capita reduction.²⁴ *California must consciously set its goals in terms of an equitable allocation of the remaining carbon budget available before we pass 1.5°C.*

Pollution is increasing rapidly worldwide—and California is massively affected. On May 17, 2022, the Lancet Commission on Pollution and Health updated its 2015 conclusions:

We find that pollution remains responsible for approximately 9 million [premature] deaths per year, corresponding to one in six deaths worldwide....[There are] increased deaths attributable to ambient air pollution and toxic chemical pollution (i.e., lead). *Deaths from these modern pollution risk factors, which are the unintended consequence of industrialisation and urbanisation, have risen by 7 percent since 2015 and by over 66 percent since 2000.*²⁵ (emphasis added)

In California, CARB reports: “Air monitoring shows that over 90 percent of Californians breathe unhealthy levels of one or more air pollutants during some part of the year.”²⁶ An independent investigation, the 2022 “State of the Air” study by the American Lung Association, found that “California has 11 of the top 25 polluted cities in the country....People of color are disproportionately impacted by air pollution, the study found. People of color are three times more likely to live in an area with failing grades for air quality categories, according to the study.”²⁷ In addition, “The San Joaquin Valley has some of the most polluted air and accounts for the second worst air quality region in the United States....There are roughly 3.9 million people in the San Joaquin Valley that are exposed to some of the nation’s most polluted air.”²⁸

A 2022 block-by-block study of emissions data in the San Francisco Bay Area finds higher levels of nitrogen dioxide and other pollutants than recorded by federal EPA’s stationary air pollution measurement stations—and *far* more in communities of color and disadvantage:²⁹ in Alameda County around 70 percent of the 180,000 Black residents “live in areas with nitrogen dioxide higher than the latest World Health Organization guideline....That compares to about 40 percent of its White residents.”³⁰

Eliminating pollution by decarbonizing pays for itself in avoided medical costs, increased productivity, and reductions in mortality. A 2020 peer reviewed study of air pollution-caused mortality in *Nature*

²² Johannes Friedrich, et al. “8 Charts to Understand US Greenhouse Gas Emissions.” World Resources Institute, 2017, updated 2021. <https://www.wri.org/insights/8-charts-understand-us-state-greenhouse-gas-emissions> California’s own methodology differs. These data use an EPA methodology that offers comparability across states.

²³ Shannon Hall, “Exxon Knew About Climate Change Almost 40 Years Ago,” Scientific American, October 26, 2015. <https://www.scientificamerican.com/article/exxon-knew-about-climate-change-almost-40-years-ago/>

²⁴ Keith Williges, et al. “Fairness critically conditions the carbon budget allocation across countries.” Global Environmental Change 74 (2022): 102481.

²⁵ www.thelancet.com/planetary-health Published online May 17, 2022: [https://doi.org/10.1016/S2542-5196\(22\)00090-0](https://doi.org/10.1016/S2542-5196(22)00090-0)

²⁶ <https://ww2.arb.ca.gov/resources/health-air-pollution>

²⁷ <https://www.ktvu.com/news/california-has-the-worst-air-quality-in-the-country-study-finds>

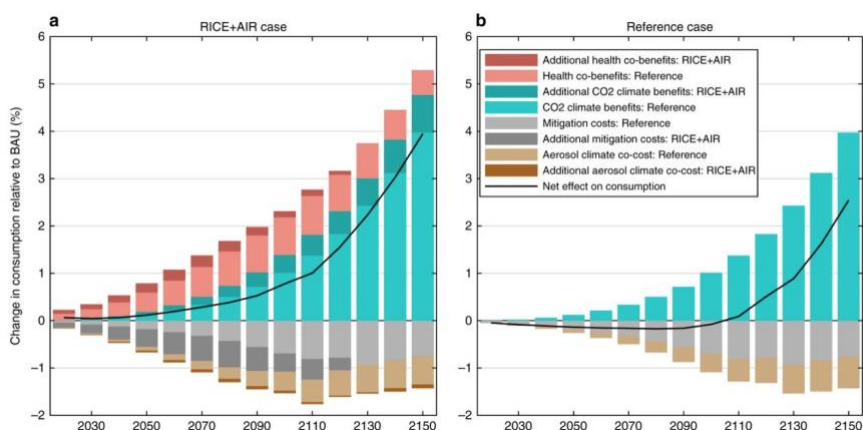
²⁸ <https://www.csustan.edu/sites/default/files/groups/Geography/Images/airpe.pdf>

²⁹ <https://air.health>

³⁰ <https://www.washingtonpost.com/climate-environment/2022/05/25/aclima-bay-area-pollution-racism/>

Sustainability modeled both mortality and emissions and their costs and benefits: “We find that approximately 14,000 premature deaths can be avoided in California in 2050 and that these health co-benefits are disproportionately higher in disadvantaged communities (that is, 35 percent of avoided deaths will come from 25 percent of the state’s population). The annualized monetary benefits (US \$215 billion) exceed the GHG abatement cost (US \$106 billion) by US \$109 billion.”³¹

The IPCC also affirms that savings from eliminating pollution exceed mitigation costs globally.³² This is shown graphically in a 2019 paper published in *Nature*, which analyzed climate benefits and costs using William Nordhaus’ Regionalized Integrated Climate Economy (RICE) model of the social costs and benefits of carbon reduction, modified to include the *health* benefits from reducing pollution. The figure below shows that when we take account of benefits from reducing pollution (shown in salmon and red) overall benefits immediately outweigh costs (gray and brown bars) *and* outweigh other climate benefits (shown in blue shades). The reference case is costs and benefits of reducing greenhouse gases absent the health benefits. In the model that includes health benefits, it takes until 2090 for the other benefits of reducing greenhouse gases to contribute more than the health benefits of reducing greenhouse gases. When we factor in health benefits the global net effect (shown by the black line) becomes immediately positive; whereas if health co-benefits were removed as in the reference scenario, mitigation and other costs would cause the net effect to be negative until 2100.³³ ***Because of the very weak health modeling in the draft Plan, these relationships and the great benefit of reducing fossil fuel pollution as rapidly as possible are not recognized.***



The IPCC AR 6 report has given us an outline of how to take into account both effectiveness and cost in choosing the measures to implement by 2030. The IPCC 2022 Working Group III report on mitigation evaluated 43 specific interventions for their ability to reduce greenhouse gas emissions prior to 2030 and for their costs. This graph appears on the next page. This is not a blueprint for California since it has a worldwide scope; and it is also not intended to take us to net-zero. What we find important and useful in the graph is that it gives us an approach that is highly consistent with AB 32’s requirements for the Scoping Plan. It describes all the maximally feasible interventions in a way that lets us assess these technologies in comparison with each other (facilitating cost effectiveness analysis) without prior assumptions as to what interventions “go together.” All of the interventions listed are judged by the IPCC to be technologically feasible in the 2030 timeframe; they include. sequestration approaches (“sinks”) as

³¹ Tianyang Wang, et al. “Health co-benefits of achieving sustainable net-zero greenhouse gas emissions in California.” *Nat Sustain* 3, 597–605 (2020). <https://doi.org/10.1038/s41893-020-0520-y>.

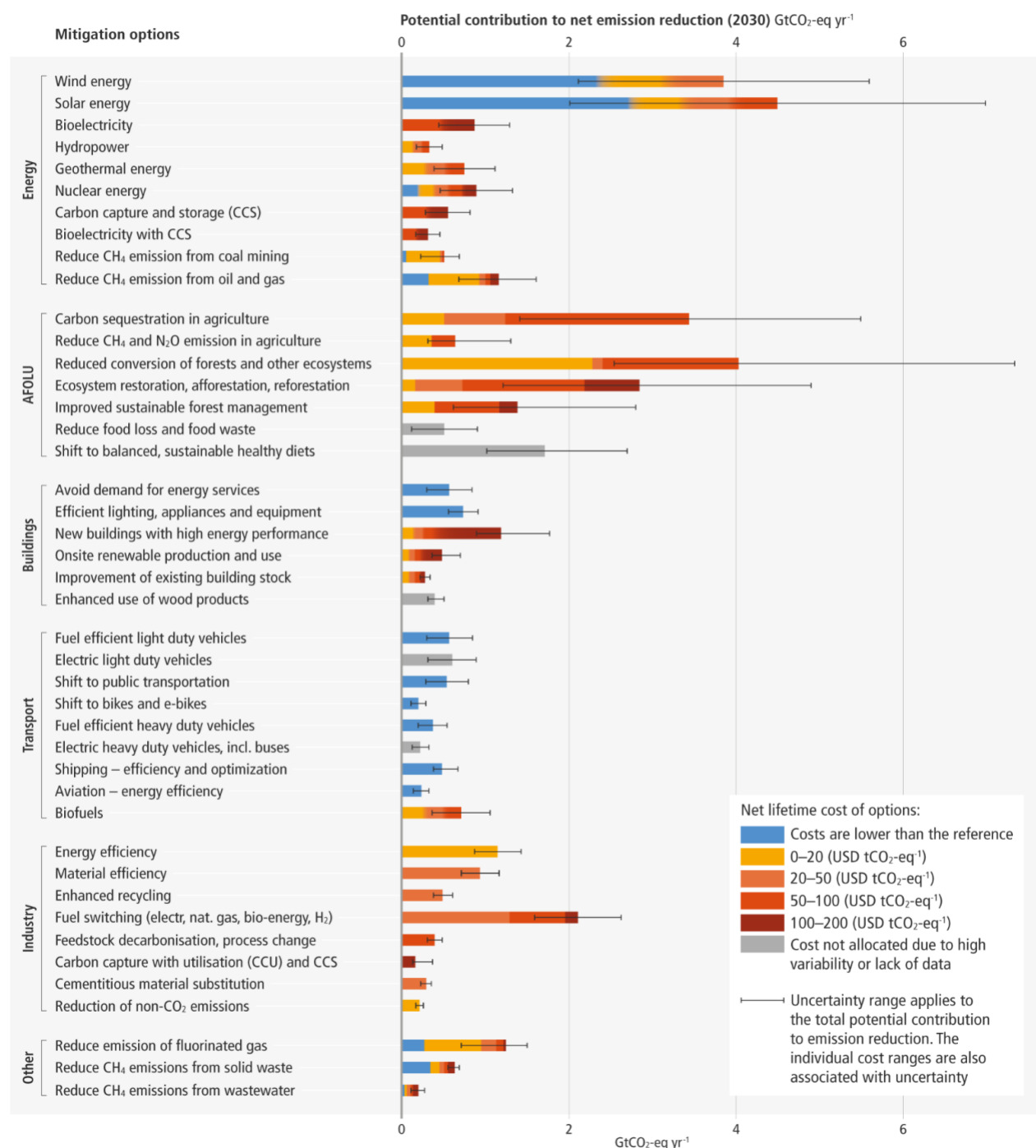
³² IPCC, op cit., 3.6.3, “The economic benefits on human health from air quality improvement arising from mitigation action can be of the same order of magnitude as mitigation costs, and potentially even larger (medium confidence).”

³³ Noah Scovronick, et al. “The impact of human health co-benefits on evaluations of global climate policy.” *Nature Communications* 10, no. 1 (2019): 1-12.

well as emissions reductions. In the graph the blue represents low-hanging fruit: reductions that are cost free. However, the graph does not include the economic and noneconomic benefits associated with ending pollution—that is, prioritizing climate justice.

IPCC Mitigation Interventions Before 2030: Cost And Effectiveness³⁴

Many options available now in all sectors are estimated to offer substantial potential to reduce net emissions by 2030. Relative potentials and costs will vary across countries and in the longer term compared to 2030.



³⁴ <https://www.ipcc.ch/report/ar6/wg3/figures/summary-for-policymakers>