September 3, 2021

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California Air Resources Board
1001 I Street, Sacramento, CA 95814

RE: 2022 Scoping Plan Update - Scenario Concepts Technical Workshop

To the California Air Resources Board,

The Center for Biological Diversity strongly supports California's climate goals and appreciates this opportunity to provide input regarding the analysis of scenarios in the development of the 2022 Scoping Plan Update to Achieve Carbon Neutrality by 2045. We offer these comments following the August 17 technical workshop on the development of scoping plan scenarios. These comments seek to respond to specific questions raised in the workshop presentations, and to provide our perspective, background information, and citations to key scientific publications relevant to components of the proposed analysis.

This analysis is most important not for the selection of an optimal scenario but as an estimation of the relative benefits of various regulatory approaches and specific policies, providing a sort of sensitivity analysis and comparison of individual policy options and timelines. As such, we encourage the Air Resources Board to present the results of the analysis in a format that allows the Air Resources Board, lawmakers, and the public to differentiate among individual policy options and timelines.

I. Carbon Neutrality Timeframe

The Center for Biological Diversity strongly supports the inclusion of Option A, which considers an expedited timeline to achieve carbon neutrality by 2035. Given the increasing urgency of the climate crisis, anything but pathways with immediate and drastic greenhouse gas emissions reductions are simply unacceptable.

This conclusion was most recently reinforced by the IPCC *Climate Change 2021* report, which the UN Secretary-General aptly stated is "a code red for humanity…[G]reenhouse gas emissions from fossil fuel burning and deforestation are choking our planet and putting billions of people at immediate risk." [1] Indeed, we are perilously close to crossing the 1.5°C global warming threshold established by the Paris Agreement, beyond which we can expect potentially catastrophic climate harms.

Globally we already are observing events such as tropical cyclones, heavy precipitation, heatwaves, and droughts that have changed in severity over time and are now attributable to human actions. [2] And for the United States specifically, The Fourth National Climate Assessment states that "[t]he impacts of global climate change are already being felt in the United States and are projected to intensify in the future…"[3] Further, as noted in a 2021 California Energy Commission report, [t]he effects of climate change are already felt today in California," with Californians between 2020 and 2021 experiencing record-breaking temperatures and horrific fires.[4] The "severity of future impacts will largely depend on actions taken to reduce greenhouse gas emissions and to adapt to the changes that will occur."[5] Such actions should include accelerating the timeline for reaching carbon neutrality.

Surface temperatures will continue to increase until at least mid-century. In a worst-case high-emissions scenario, the global average temperature in 2100 could end up 10.2°F (5.7°C) higher than in 1900.[6] Even in a best-case low-emissions scenario, we are likely committed to slightly overshooting 1.5°C, but with a drop back below 1.5°C by the end of the century.[7] So only a best-case scenario keeps warming to 1.5°C, proving the need for stringency and immediacy in cutting greenhouse gas emissions. Global warming will exceed both 1.5°C and 2°C unless deep reductions in CO_2 and other greenhouse gas emissions occur in the coming decades.[8]

As first established in the IPCC 2018 *Special Report*, pathways to limit global warming require "a rapid phase out of CO_2 emissions and deep emissions reductions in other GHGs and climate forcers."[9] In that report, it was found that pathways consistent with limiting warming to 1.5°C require global anthropogenic CO_2 emissions to decline by about 45 percent below 2010 levels by 2030 and reach near zero around 2050.[10] The *Climate Change 2021* report builds upon the *Special Report* and estimates that, for a 67% chance of limiting warming to 1.5°C, total emissions of 400 $GtCO_2$ must not be exceeded from January 2020 onwards.[11] Global emissions are currently about 40 $GtCO_2$ per year, so this emissions cutoff would be passed in about 10 years without immediate and drastic action to reduce global emissions.

The United States, as the world's largest cumulative historical emitter and second-largest current emitter, has a responsibility to make much larger emissions reductions than the global average. And California, representing the largest share of the U.S. economy, likewise has an outsized responsibility in addressing global emissions. California fulfilling that responsibility means reaching carbon neutrality well before 2045.

The attached comment letter submitted by the Center for Biological Diversity, as part of the Last Chance Alliance, to CalEPA on July 19, 2019, identifies top priorities for the carbon neutrality studies contracted by CalEPA in 2019. (See Attachment A1.)

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[1] United Nations Secretary-General, Secretary-General's statement on IPCC Working Group 1 Report on the Physical Science Basis of the Sixth Assessment (August 9, 2021), https://www.un.org/sg/en/content/secretary-generals-statement-the-ipcc-working-group-1-report-the-physical-science-basis-of-the-sixth-assessment.

[2] Intergovernmental Panel on Climate Change, Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2021) at SPM-10.

[3] U.S. Global Change Research Program, Impacts, Risks, and Adaptation in the United States, Fourth National Climate Assessment, Volume II (2018), https://nca2018.globalchange.gov/ at 34.

[4] California Energy Commission, 2021 SB 100 Joint Agency Report (2021), Available at: https://www.energy.ca.gov/sb100#anchor_report.

[5] U.S. Global Change Research Program, Impacts, Risks, and Adaptation in the United States, Fourth National Climate Assessment, Volume II (2018), https://nca2018.globalchange.gov/ at 34.

[6] Intergovernmental Panel on Climate Change, Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2021)at SPM-17.

[7] Intergovernmental Panel on Climate Change, Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2021)at SPM-18.

[8] Intergovernmental Panel on Climate Change, Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2021)at SPM-17.

[9] Rogelj, Joeri et al., 2018: Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development. *In:* Global Warming of 1.5°C, An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (2018), https://www.ipcc.ch/sr15/ at 112.

[10] Rogelj, Joeri et al., 2018: Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development. *In:* Global Warming of 1.5°C, An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (2018), https://www.ipcc.ch/sr15/ at 95, Figure 2.5, Figure 2.6; also at Summary for Policymakers at 12-14.

[11] Intergovernmental Panel on Climate Change, Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2021) at SPM-38.

II. Role of Engineered Carbon Removal

The Center for Biological Diversity strongly supports Option A, which excludes CCS. The attached comment letter dated August 16, 2021 (Attachment A2--Comments on Engineered Carbon Removal Technical Workshop) details why CARB should not include CCS as part of the state's emissions reduction strategy. CCS delays the needed transition away from fossil fuels and other combustible energy sources, and poses serious environmental, health, and safety risks, particularly to Black, Brown, and Indigenous communities already overburdened by industrial pollution. The widespread opposition to CCS from hundreds of organizations—recognizing that CCS is a false climate solution that undermines environmental justice and climate goals[12]—should alert CARB that CCS should not be part of a just, equitable, effective climate strategy.

We also urge CARB to analyze options other than CCS for the industrial sector. Applying CCS to high-emitting industrial activities like steel and cement manufacturing is not economical; renewable sources for electricity and heat can substantially reduce industrial emissions; and reduction, reuse and recycling can play a significant role in lowering industrial emissions.[13]

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[12] CAN Position: Carbon Capture, Storage, and Utilization, Climate Action Network Int'l at 6 (2021), https://climatenetwork.org/resource/can-position-carbon-capture-storage-and-utilisation/; Center for International Environmental Law, "Carbon capture is not a climate solution" (July 2021), https://www.ciel.org/wp-content/uploads/2021/07/CCS-Letter_FINAL_US-1.pdf; White House Environmental Justice Advisory Council, Final Recommendations: Justice40 Climate and Economic Justice Screening Tool & Executive Order 12898 (May 2021), https://www.epa.gov/sites/default/files/2021-05/documents/whiteh2.pdf

[13] Center for International Environmental Law, Confronting the Myth of Carbon Free Fossil Fuels: Why Carbon Capture is Not a Climate Solution (2021), https://www.ciel.org/wp-content/uploads/2021/07/Confronting-the-Myth-of-Carbon-Free-Fossil-Fuels.pdf

III. Carbon Free Electricity Grid

The Center for Biological Diversity supports the inclusion of "no combustion" alternatives that exclude the use of biomass. Such analysis can be informative in evaluating the potential contribution of biomass energy in comparison to other options. It is important that the analysis use a scientifically based estimate of the carbon implications of biomass energy, one that takes into account the full range of emissions from the sourcing of biomass feedstock. These emissions may be most significant with respect to forest woody biomass. Forest woody biomass is discussed in greater detail below.

IV. Vehicle Miles Traveled (VMT)

Given the emissions associated with the transportation sector, the analysis should consider scenarios more ambitious than the proposed Option A--VMT per capita reduced 20% below 2020 levels by 2045. For example, 20% below 2020 levels by 2030 would allow us to assess the potential benefits of accelerating these policies.

VMT estimates and calculations in this analysis should use the more comprehensive tour-based VMT approach, as defined in the 2018 Technical Advisory from the California Office of Planning and Research.[14] Providing a direct comparison to current per capita averages is particularly informative in assessing the relative value of reduction measures. Also, the analysis should consider the benefits of ensuring that mitigation for projects with significant VMT impacts under CEQA contribute to reductions in the overall city and regional per capita VMT at a level needed to meet aggressive reduction targets.

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[14] State of California, Governor's Office of Planning and Research: Technical Advisory on Evaluating Transportation Impacts in CEQA (December 2018), https://opr.ca.gov/docs/20190122-743_Technical_Advisory.pdf

V. Vehicle Fleet Electrification

We strongly support the inclusion of options that consider accelerating the transition to zero-emission vehicles. The value of this analysis will come not from simply estimating the comparative difficulty of achieving 100% ZEV sales before 2035, but from identifying the potential benefits associated with an accelerated transition to ZEVs and the achievement of incremental reductions in the interim. As such, we strongly support the study of Options A and B, which achieve carbon neutrality by 2035 by committing to 100% ZEV sales by 2025 or 2030. In its analysis, we urge CARB to consider the full range of benefits that would come from this expedited timeline, including: climate-related economic benefits from reducing GHG emissions, reduced rates of particulate matter-related health problems, consumer fuel savings, and increased EV market penetration and opportunities for job growth in that sector.

The attached comment letter submitted to CalEPA on January 15, 2020, details our position on achieving carbon neutrality with respect to transportation fossil fuel demand and emissions. In this letter we recommend setting a goal of 100% ZEV sales by 2030, with a focus on accessibility and availability for different income groups. (See Attachment A3.)

The attached comment letter submitted to the Air Resources Board on June 11, 2021, regarding the Advanced Clean Cars II rule, recommends a standard of 100% ZEV sales by 2030 and a minimum of 7% annual reductions in GHG emissions. (See Attachment A4.)

VI. Petroleum Fuels

In addition to analyzing options for ramping down fossil fuel production linearly to phase-out by 2035, the analysis should consider specific policy options for achieving that reduction. Specifically, the analysis should consider the emissions implications of halting the approval of new drilling permits, a halt to new permits within 2500 feet of sensitive receptors, and a halt to all well operations within 2500 feet of sensitive receptors, and a differential ramp down of oil fields based on the carbon intensity of their particular crude production. Considering the high carbon intensity of crude oil production is crucial to understanding both the differences among oil fields in California, and the carbon benefits to accelerating in-state crude production. Furthermore, Option D—a ramp down of petroleum production in line with fossil fuel demand—should explicitly incorporate the various options for VMT reductions and ZEV adoption.

The attached report by the Center for Biological Diversity, titled "Killer Crude: How California Produces Some of the Dirtiest, Most Dangerous Oil in the World," dated June 2021, details the high GHG emissions and environmental impacts associated with crude oil production in California. (See Attachment A5.)

VII. Short Lived-Climate Pollutant Methane

Animal agriculture plays a key role in methane pollution in California. The scenarios analysis should consider the full costs and impacts of digesters not just in terms of construction and ongoing operation, but also the implications of extending the lifespan of large operations. That is, while some reduction measures might show benefits at the individual operation level, they often don't provide reductions from the industry as a whole. Other environmental implications include water quality and air quality, from ammonia in particular, but also hydrogen sulfide, PM, and nitrous oxide.

The scenarios analysis should look beyond digesters to more comprehensive solutions, including a just transition to sustainable non-animal based farming practices. For example, the analysis could identify the potential benefits of transitioning away from dairy enterprises and into sustainable, plant-based farming practices, considering options for reducing emissions at the sector level rather than at the level of individual operations.

VIII. Woody Biomass and Solid Biomass Waste

It is important that the analysis use a scientifically based estimate of the carbon implications of biomass energy, one that takes into account the full range of emissions from the sourcing of biomass feedstock. These emissions may be most significant with respect to forest woody biomass.

While California is experiencing extremely high particulate pollution levels due to wildfires, assigning particular emissions to specific fires is extremely difficult, as is estimating the total greenhouse gas emissions from a fire. Similarly, given the stochastic nature of wildfire, and the importance of the timing of management activities in relation to fire, it would be extremely difficult to estimate reductions in smoke emissions associated with a particular forest management action. It does not appear from the UCI presentation that the SMOKE model of air pollutants is expected to include smoke from wildfires. However, if CARB decides to include an estimate of smoke emissions from wildfire, we highly recommend holding a workshop dedicated to this issue.

The attached comment letter submitted the Air Resources Board on October 30, 2017, details the limitations and shortcomings of the CALAND model ARB has proposed using to estimate GHG emissions associated with natural and working lands. (See Attachment A6.)

The attached document titled "Forest Biomass Energy Is a False Solution" describes the problems with forest biomass energy as an electricity source. (See Attachment A7.)

The attached comment letter submitted by the Center for Biological Diversity, John Muir Project, and Earth Island Institute to the Air Resources Board on February 26, 2021, provides recommendations for improving the methods of estimating carbon emissions from forests and wildfire. (See Attachment A8.)

IX. Emissions from Wildfire

While California is experiencing extremely high particulate pollution levels due to wildfires, assigning particular emissions to specific fires is extremely difficult, as is estimating the total greenhouse gas emissions from wildfire. Similarly, given the stochastic nature of wildfire, and the importance of the timing of management activities in relation to fire, it would be extremely difficult to estimate reductions in smoke emissions associated with a particular forest management action. It does not appear from the UCI presentation that the SMOKE model of air pollutants is expected to include smoke from wildfires. However, if CARB decides to include an estimate of smoke emissions from wildfire, we strongly recommend holding a workshop dedicated to this issue.

The attached comment letter submitted by the Center for Biological Diversity, John Muir Project, and Earth Island Institute to the Air Resources Board on February 26, 2021, provides recommendations for improving the methods of estimating carbon emissions from forests and wildfire. (See Attachment A8.)

X. Social cost of carbon.

The Interagency Working Group's (IWG's) most recent social cost of carbon, methane, and nitrous oxide "SC-GHG" estimates[15] significantly underestimate the true societal damages of greenhouse gas emissions, as acknowledged by the IWG itself.[16] Some key limitations are the use high discount rates that do not reflect intergenerational equity, the failure to incorporate multiple sources of uncertainty, and the omission of the costs of many important physical, ecological, and economic impacts of emissions and resulting climate change, effectively valuing these harms at zero. In CARB's work with the Rhodium Group to develop social cost of carbon estimates, we urge CARB to ensure that the estimates reflect, to the greatest extent possible, the full societal damages from GHG emissions and resulting climate change based on the current climate change and economics literature; comprehensively and transparently incorporate uncertainty; and consider adopting a zero, or even negative discount rate. The attached comment letter dated June 21, 2021 on the Interim SC-GHG estimates details these concerns and recommendations. (See Attachment A9.)

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[15] Interim figures were published by the Interagency Working Group in February 2021 and the IWG expects to publish updated figures in January 2022. Interagency Working Group on Social Cost of Greenhouse Gases, Technical Support Document (Feb. 2021), https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf?source=email

[16] Interagency Working Group on the Social Cost of Greenhouse Gases, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide – Interim Estimates Under Executive Order 13,990 (2021) at 4, 31, https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf

XI. Greenhouse Gas Emissions Related to Pesticides

The analysis of Natural and Working Lands measures should include pesticides' contribution to greenhouse gas emissions, pesticides' deleterious impact on soil's ability to sequester carbon, and analyze organic farming and pesticide reduction as a critical nature-based climate solution. Reducing pesticide use in agriculture operations not only mitigates climate change, but also addresses serious environmental justice concerns.

Pesticide use in California is a significant, yet overlooked, factor in greenhouse gas emissions in agricultural lands. The analysis should consider options for reducing emissions associated with pesticides. Specifically, the analysis should consider the contribution of commonly-used fumigants to GHG nitrous oxide emissions. Soil fumigants can cause increased emissions of nitrous oxide (N_2O) and represent roughly one-fifth of the pesticides used in California. Application of the commonly used fumigant chloropicrin can significantly increase N_2O production.[17] Similar classes of fumigants can yield similar increases in emissions. Other methyl isothiocyanate-producing fumigants--metam sodium and dazomet--also increase nitrous oxide production significantly.[18] Tens of million pounds of these three fumigants are used every year in California fields.[19] The analysis should also consider options to curb sulfuryl fluoride, a commonly used fumigant that is a toxic air contaminant and an extremely potent short-lived climate pollutant.

The analysis should also consider pesticides' contribution of volatile organic compounds (VOCs), an ozone precursor.[20] Tropospheric ozone (O_3) is one of the most important greenhouse gases contributing to climate change.[21] VOC emissions related to pesticides include the fumigants methyl bromide, 1,3-dichloropropene, chloropicrin, metam sodium, metam potassium and dazomet. In California's San Joaquin Valley, an ozone and VOC non-attainment area, 65% of VOC emissions are from high VOC formulations of non-fumigant pesticides including abamectin, chlorpyrifos, gibberellins and oxyfluorfen.[22]

Pesticides also have substantial negative impacts on soil carbon sequestration. Synthetic pesticides, through their deleterious effect on microorganisms, decrease the soil's capacity to sequester carbon, reduce soil organic matter and the many associated benefits including cycling and provision of nutrients, suppress of phytopathogens, and build resistance to both biotic and abiotic stressors. A recent review of almost 400 studies showed pesticide use was associated with damage to soil invertebrates in more than 70% of the studies.[23] Pesticide impacts include inhibition of nitrogen-fixing bacteria, decreased populations of mychorrhizal fungi, detrimental shifts in nematode populations, and decimation of earthworm populations. The analysis should consider the soil carbon sequestration benefits of reducing pesticide use.

Achieving carbon neutrality requires building on proven tools for sequestering carbon and reducing emissions such as increased organic agricultural production and reduction of pesticide use. A UC Davis Long-Term Research on Agricultural Systems study found that after 10 years, organic systems dramatically increased the rate of carbon sequestration.[24] That trend continues over longer periods.[25] This proven strategy should be analyzed by ARB and implemented in the upcoming scoping plan.

[17] Spokas K., Wang D. 2003. Stimulation of nitrous oxide production resulted from soil fumigation with chloropicrin. *Atmospheric Environment* 37 (2003) 3501–3507. https://doi.org/10.1016/S1352-2310(03)00412-6

[18] Spokas K., Wang D., Venterea. R. 2004. Greenhouse gas production and emission from a forest nursery soil following fumigation with chloropicrin and methyl isothiocyanate. *Soil Biology & Biochemistry* 37 (2005): 475–485. https://doi.org/10.1016/j.soilbio.2004.08.010

[19] Department of Pesticide Regulation annual Pesticide Use Reports. https://www.cdpr.ca.gov/docs/pur/purmain.htm.

[20] Department of Pesticide Regulation, Volatile Organic Compound (VOC) Emissions from Pesticides https://www.cdpr.ca.gov/docs/emon/vocs/vocproj/vocmenu.htm

[21] IPCC, Atmospheric Chemistry and Greenhouse Gases, https://www.ipcc.ch/site/assets/uploads/2018/03/TAR-04.pdf

[22] UC Agriculture and Natural Resources, Volatile Organic Compound (VOC) Emissions from Pesticides, https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=11273

[23] Gunstone et al. (2021) Pesticides and Soil Invertebrates: A Hazard Assessment, Frontiers in Environmental Science. 9, 122. https://www.frontiersin.org/article/10.3389/fenvs.2021.643847.

[24] Kong, A. Y., Six, J., Bryant, D. C., Denison, R. F., & Van Kessel, C. (2005). The relationship between carbon input, aggregation, and soil organic carbon stabilization in sustainable cropping systems. *Soil Sci Soc Am J.*, 69, 1078-1085.

[25] Wolf, K., Herrera, I., Tomich, T. P., & Scow, K. (2017). Long-term agricultural experiments inform the development of climate-smart agricultural practices. *California Agriculture, 71,* 120-124.

We would be pleased to provide any scientific publications cited in these comment letters. Please let me know if you have any questions on any of these comments.

We look forward to working with the Air Resources Board and other stakeholders in developing the Scoping Plan Update over the coming months.

Sincerely,

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