



WORLD  
RESOURCES  
INSTITUTE

June 23, 2022

Liane M. Randolph  
California Air Resources Board  
1001 I St  
Sacramento, CA 95814

RE: Comments on Draft 2022 California Scoping Plan Update

Dear California Air Resources Board,

Thank you for the opportunity to provide comment on the 2022 Draft Scoping Plan. I am writing on behalf of the World Resources Institute (WRI), a global research organization that works on sustainability and climate challenges around the world at the international, national, and subnational level. We support the scoping plan process and applaud California's role as a climate leader in the United States. However, given the urgency of the climate crisis, we see a need for greater ambition than what is outlined in the Draft Scoping Plan's Proposed Scenario.

Our comments focus on a few specific areas of the Draft Scoping Plan. Lack of comment on other issues does not constitute agreement or disagreement in those areas nor does it imply that those issues are less important.

1. We recommend CARB examine a scenario for reaching net-zero by 2040 as a complement to the two scenarios that look at net-zero by 2035 and the two that look at net-zero by 2045.
  - a. Governor Newsom requested<sup>1</sup> identification of a pathway that can lead to carbon neutrality earlier than the existing target of 2045. Increasing ambition from the existing 2045 target is supported by technological and scientific developments since that target was established in 2018, including six of the largest wildfires on record in the state.
  - b. Given that the Draft Scoping Plan asserts that a scenario that doesn't achieve net zero emissions until 2045 "best achieves the balance of cost-effectiveness, health benefits, and technological feasibility," carefully considering a scenario for net-zero by 2040 would provide the Board with an additional option that is responsive to the Governor's request and could be found to provide a better balance than any of the scenarios examined in the Draft.
2. Across all scenarios, including the proposed net-zero by 2040 scenario, we urge CARB to identify ways to achieve deeper emissions reductions that would lead to a more modest reliance on carbon dioxide removal (CDR) technologies. While we support responsible development and deployment of CDR technologies and recognize the key role they will almost certainly play in meeting the state's climate goals, as well as national and international climate goals, the levels of reliance on technologies like direct air capture in the Proposed Scenario are higher than what is necessary. We urge consideration of scenarios that use a broad portfolio of technologies to

---

<sup>1</sup> [https://www.gov.ca.gov/wp-content/uploads/2021/07/CARB-Letter\\_07.09.2021.pdf](https://www.gov.ca.gov/wp-content/uploads/2021/07/CARB-Letter_07.09.2021.pdf)

achieve a 90% reduction in direct emissions from sources by the net-zero target date and the use of CDR technologies to balance out the remaining 10% of emissions, rather than less than 80% emissions reductions included in the two 2045 scenarios.

- a. We recommend consideration of a balanced portfolio of CDR approaches and technologies to reduce risk related to reliance on any one technology. WRI research<sup>2</sup> shows that a robust and balanced portfolio of CDR approaches and technologies can reduce cost and risk while maximizing the amount of carbon removed. The Lawrence Livermore National Lab's 2020 *Getting to Neutral* report<sup>3</sup> identifies promising CDR pathways to meet the expected need in California and finds the highest potential among engineered solutions to be use of waste biomass for conversion to fuel (such as hydrogen) with CO<sub>2</sub> sequestration. The report also emphasizes the importance of a portfolio of approaches given the tradeoffs associated with each and differing applicability across the state.
  - b. We recommend sustained use of CDR in combination with continuing emissions reductions after net-zero is achieved to align with Executive Order B-55-18, which sets a goal to "achieve and maintain net-negative emissions"<sup>4</sup> after carbon neutrality is achieved. This contrasts with the two 2035 scenarios which include declining levels of CDR after 2035.
3. We believe that the average costs of carbon removal assumed in the Draft Scoping Plan are substantially too high and appear to be reported inaccurately in the document.
- a. All the scenarios report an average cost for "compensating for remaining emissions" of \$745/ton for 2022-2045. This is implausible given that it appears that the cost/ton of CDR is assumed to decline over time and given that the pattern of CDR over time is different in each scenario.
  - b. For example, assuming costs fall from \$600/ton in 2030 to \$100/ton in 2045, we calculate that the average cost per ton would vary from \$330 in Alternative 1 to \$230 in the proposed scenario (Alternative 3).<sup>5</sup>
  - c. In any case, we believe that the average cost/ton of CDR reported in the Draft Scoping Plan is much too high given the high level of investment and innovation currently occurring across a wide range of CDR technologies. For example, the US Department of Energy Carbon Negative Shot initiative has set a goal of reducing the cost of CDR to less than \$100/ton within a decade.<sup>6</sup> If this goal is achieved the total cost for carbon removal in 2035 in Alternative 2 would be less than \$12.3 billion rather than \$92 billion as suggested in the Draft Scoping Plan.<sup>7</sup> The cost of CDR would be even lower in each of the other scenarios, which rely less on CDR.

---

<sup>2</sup> <https://www.wri.org/research/carbonshot-federal-policy-options-carbon-removal-united-states>

<sup>3</sup> [https://gs.llnl.gov/sites/gov/files/2021-08/getting\\_to\\_neutral.pdf](https://gs.llnl.gov/sites/gov/files/2021-08/getting_to_neutral.pdf)

<sup>4</sup> <https://www.ca.gov/archive/gov39/wp-content/uploads/2018/09/9.10.18-Executive-Order.pdf>

<sup>5</sup> Calculating using the CDR rows for each alternative as reported in the "2022-draft-sp-PATHWAYS-data-E3" spreadsheet made available on the CARB website and a cost/ton of CDR declining linearly from \$600/ton in 2030 to \$100/ton in 2045.

<sup>6</sup> <https://www.energy.gov/fecm/carbon-negative-shot>

<sup>7</sup> Calculated as \$100/ton x 123 million tons of CDR reported in the "2022-draft-sp-PATHWAYS-data-E3" spreadsheet, compared to Figure 3-2

- d. Adopting more reasonable assumptions about the cost of CDR and correcting any reporting errors will make a material difference in assessing the feasibility and cost-effectiveness of achieving net-zero emissions well before 2045.

Thank you again for the opportunity to provide comment. We hope this input will help inform a more robust and ambitious Scoping Plan that can help California remain a climate leader in the United States and globally.

Sincerely,

Daniel Lashof  
Director, World Resources Institute – United States  
Berkeley, California