

Well setbacks limit California's oil supply with larger health benefits and employment losses than excise and carbon taxes

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Compared to excise taxes and carbon taxes, setback restrictions on new oil wells have larger health benefits and worker compensation losses, but are more equitable by bringing greater benefits and lower losses to disadvantaged communities in California. For California to meet green gas emissions (GHG) targets, larger setbacks than currently proposed or additional supply-side policies are needed.

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The policy problem

California's transportation green gas emissions (GHG) remain high, accounting for half of statewide emissions in 2022. The state has implemented demand-side policies such as vehicle fuel economy standards, low carbon fuel standards, and electric vehicle subsidies to tackle the issue. Yet, without complementary supply-side policies, California could continue extracting oil and exporting to the global market, potentially undermining GHG reductions. Oil well setbacks – drilling bans on locations near homes, schools, health clinics and other sensitive sites – and oil excise taxes and carbon taxes are all viable options to reduce GHG emissions from oil extraction. However, such policies have trade-offs: they improve air quality but also lower employment near oil extraction, with potential for unequal distribution of costs and benefits. To support the state's goals of achieving a just environmental and energy transition, decarbonization policy needs to be evaluated not only in terms of its ability to reduce GHG emissions, but also in terms of which communities see its air quality benefits and employment costs. This policy debate is especially timely: California passed a 3,200 ft (975 m) setback restriction on new oil wells in 2022 but that law has been suspended until the outcome of a referendum vote in 2024.

The findings

For a statewide 2045 GHG target, we find that setbacks applied to new oil wells generate the largest health benefits in terms of avoided mortality from reduced particulate matter air pollution, but also the largest lost worker compensation. This is followed by excise taxes and carbon taxes (see Fig. 1 for details). Setbacks also have the most favourable equity

outcomes by yielding the highest share of health benefits and the lowest share of lost worker compensation borne by disadvantaged communities. However, even a 1-mile setback – the largest considered in this study and much larger than the 3,200 ft (975 m) currently proposed in California – may fail to meet California's ambitious 90% GHG reduction target by 2045. Meeting this target will require combining setbacks applied to both existing and new oil wells with other supply-side policies such as excise taxes and carbon taxes.

The study

We combine a statistically-estimated model of oil field production, an air pollution dispersion model, and an employment impact model to examine how different setback, excise tax, and carbon tax policies would lower production and GHG emissions from oil extraction, alter oil worker compensation across the state, and alter the distribution of local air pollution between disadvantaged and other communities. We draw on over five decades of historical, field-level oil production and reserves data from California's state government agencies as well as proprietary data on oil production costs. Because of data limitations, we are likely understating the health benefits of supply-side policies by only quantifying mortality related to particulate air pollution and overstating labour costs by failing to capture re-employment possibilities for workers affected by oil production phaseout.

Recommendations for policy

- Oil supply-side policies including setbacks on new and/or existing oil wells, excise taxes, and carbon taxes can help phase out oil extraction and achieve carbon emissions mitigation goals.
- For the same 2045 GHG reduction target, oil well setbacks generate the largest statewide health benefits in terms of avoided mortality but also the largest statewide lost worker compensation, followed by excise taxes and carbon taxes.
- Setbacks may achieve the most equitable outcomes, with the highest share of health benefits and the lowest share of lost worker compensation borne by disadvantaged communities.
- Setbacks on new oil wells alone are unlikely to achieve California's 2045 90% GHG mitigation target and may need to be extended to existing oil wells and combined with an excise tax or carbon tax.

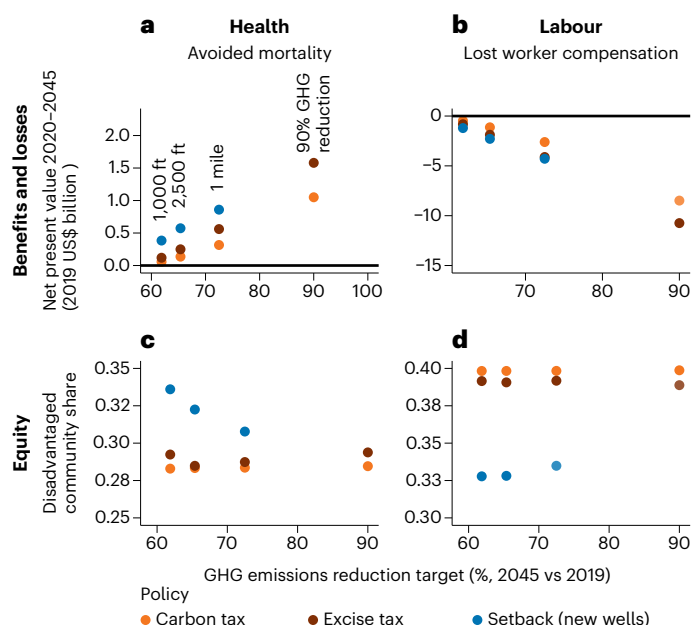


Fig. 1 | Health, labour, and equity outcomes of supply-side policies for decarbonizing oil extraction in California. Total health benefits from avoided mortality (a), total lost worker compensation (b) over 2020–2045, share of avoided mortality benefits accrued to individuals (c), and share of foregone worker compensation from oil extraction borne by workers (d) in disadvantaged communities under three supply-side policies – setbacks applied to new wells

and equivalent excise tax on oil production and carbon tax on GHG emissions from oil extraction – relative to the no-supply-side policy business-as-usual scenario to meet four 2045 GHG emissions targets. No setback distance equivalent to 90% 2045 GHG emissions target is applied. Net present values are in 2019 US\$ dollars, estimated using a discount rate of 3%. Figure is adapted from *Nat. Energy* 10.1038/s41560-023-01259-y; 2023.

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Further reading

- Erickson, P., Lazarus, M. & Piggot, G. Limiting fossil fuel production as the next big step in climate policy. *Nat. Clim. Chang.* **8**, 1037–2043 (2018).
This study examines the effects of limiting oil production on carbon emissions in California.
- Elkind, E. N. & Lamm, T. *Legal Grounds: Law and Policy Options to Facilitate a Phase-Out of Fossil Fuel Production in California* (Berkeley Center for Law, Energy and the Environment, 2020); <https://www.law.berkeley.edu/wp-content/uploads/2020/04/Legal-Grounds.pdf>.
This study highlights the law and policy options including excise or severance taxes and oil well setbacks to facilitate the phase-out of oil production in California.
- Ericson, S. J., Kaffine, D. T. & Maniloff, P. Costs of increasing oil and gas setbacks are initially modest but rise sharply. *Energy Policy* **146**, 111749 (2020).
This study estimates the oil and gas resource and revenue loss under various oil well setback distances in the U.S. state of Colorado.
- Kunce, M. Effectiveness of Severance Tax Incentives in the U.S. Oil Industry. *Int. Tax Public Finance* **10**, 565–587 (2003).
This study examines the impacts of severance or excise taxes on oil drilling and production activity across U.S. states.

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5. Mayfield, E., Jenkins, J., Larson, E. & Greig, C. Labor pathways to achieve net-zero emissions in the United States by mid-century. *Energy Policy* **177**, 113516 (2023).

This study estimates the labor impacts of a transition to a net-zero emissions energy system which includes the retirement of oil and gas infrastructure.

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Competing interests

The authors declare no competing interests.