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# Carbon Offsets

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- **Summary:** In the of the Western Climate Initiative cap-and-trade program's first three compliance periods (2013–2020), covered entities used almost 159 million offset credits for compliance purposes. Nearly 139 million offsets were used by covered entities in California. About 80% of all offset credits come from CARB's forest offset protocol, which has been criticized for issuing credits that may not reflect real climate benefits and for failing to adequately insure against the risk of wildfire and other carbon losses. We review the use of carbon offsets in California's program, criticisms of CARB's forest offset program's performance relative to statutory requirements, and potential options for reform.

## How carbon offsets work

This chapter addresses the effect of carbon offsets on greenhouse gas emissions. Although offsets can also provide benefits to local environmental quality and regional economic development, we do not address those topics here. Nor do we evaluate concerns that offset use may perpetuate pollution in historically overburdened communities.

The cap-and-trade program provides incentives to reduce greenhouse gas emissions in covered sectors, which are responsible for about 75% of California's statewide emissions. Carbon offsets extend those incentives to sectors and jurisdictions not covered by the cap-and-trade program, most notably in the natural and working lands sector. The benefits of reducing emissions and increasing carbon sequestration in uncapped sectors can be significant, but the challenge facing governments is how to accurately measure and reward outcomes in uncapped sectors.

Carbon offset programs allow participating projects to earn offset credits, each worth 1 $tCO_2e$, for voluntary climate mitigation efforts that are recognized outside of the cap-and-trade program's covered sectors — that is, in a part of the economy where emitters are not directly regulated under the cap-and-trade program. Sometimes offset projects are based in California, but often they are located throughout the United States.

In a cap-and-trade program without offsets, all necessary emission reductions must occur within capped sectors. When a cap-and-trade program allows covered emitters to use carbon offsets in addition to the normal supply of pollution allowances, however, then the total pollution allowed within capped sectors increases by the number of offsets used — credits that, in turn, represent an equal number of climate benefits claimed outside the capped sectors. For

example, an oil refinery in the Los Angeles area could buy offset credits from a forest management project in Alaska that claims to delay or avoid the harvest of commercially viable timber under the terms of California's forest offset protocol. By expanding the number of compliance instruments in California's cap-and-trade program, this transaction increases the total climate pollution allowed in capped sectors in exchange for climate benefits claimed in the Alaska forest. The result: emissions increase in California's industrial sector but decrease in Alaska's forestry sector.[1]

Offset credits must accurately reflect climate benefits because they enable higher pollution in capped sectors. Accurate carbon offset programs do no harm to the climate: they neither accelerate the pace of overall climate mitigation nor detract from it. Instead, they act to reduce total program compliance costs (by providing a greater number of options by which covered emitters can comply with program requirements) and create funding for mitigation activities outside program caps (as covered emitters' purchase of offset credits funds climate projects in uncapped sectors like forestry). When a conventional offsets program issues more credits than the climate benefits it achieves in practice, however, then it increases net emissions.

## Carbon offsets in California

California's cap-and-trade program allows covered emitters to use carbon offsets to satisfy part of their compliance obligations, in addition to conventional pollution allowances. Although offset credits can be issued by any regulator participating in the linked Western Climate Initiative (WCI) cap-and-trade program, California has issued about 99.5% of credits to date and is therefore the de facto offsets regulator. CARB's U.S. Forest Projects protocol is responsible for about four-fifths of all offset credits issued in the WCI program (Table 1).

[1] We note that sectoral accounting details matter for determining compliance with California's statewide 2020 and 2030 emissions limits; see Health & Safety Code §§ 38550, 38566 (defining limits in terms of "statewide emissions"). Most offset credits are issued for sectors and/or jurisdictions that are not included in California's official statewide greenhouse gas inventory (CARB 2021a). When offset credits are used by covered emitters in California, however, they enable higher emissions that are tracked in California's inventory in exchange for climate benefits claimed outside of the inventory. Thus, although perfectly credited offsets have no impact on net greenhouse gas emissions, their use strictly increases statewide emissions as that concept is currently tracked in California's inventory and used to evaluate compliance with the 2020 and 2030 emission limits.

**Table 1: Offset credit issuance by protocol (CARB 2022)**

| Jurisdiction | Protocol | Credits ($tCO_2e$) | Share (%) |
|---|---|---|---|
| California | U.S. Forest Projects [2] | 189,811,822 | 81.7% |
| | Ozone Depleting Substances | 24,305,693 | 10.5% |
| | Mine Methane Capture | 8,994,363 | 3.9% |
| | Livestock Manure Digesters | 8,250,214 | 3.5% |
| | Urban Forest Projects (not used) | — | — |
| | Rice Cultivation (not used) | — | — |
| Québec | Ozone Depleting Substances | 578,785 | 0.2% |
| | Landfill Site Methane Destruction | 473,615 | 0.2% |

California's cap-and-trade program limits the number of offset credits each covered emitter can use. By regulation, that limit was 8% of a covered emitter's total compliance obligations for each of the first three compliance periods (2013–2020).[3] In practice, covered emitters in California surrendered almost 139 million offsets, or about 6.3% of their total emissions during this period; WCI-wide usage came to just under 159 million offsets, or about 6.2% of total emissions (see Table 2).

State law requires that offset credits used in California reflect climate benefits that are "real, permanent, quantifiable, verifiable, and enforceable."[4] Credited climate benefits must also be additional in relation to "any greenhouse gas emission reduction otherwise required by law or regulation, and any other greenhouse gas emission reduction that would otherwise occur."[5] CARB further defines the additionality standard by requiring "conservative" baseline emission scenarios, assumptions, and methodologies that "are more likely than not to understate net [greenhouse gas] reductions or [greenhouse gas] removal enhancements."[6]

Another important concern to California stakeholders is the impact of offsets on broad environmental outcomes including air quality, water management, and ecological

2 Total credits reported. Included in this amount are 29,819,664 credits in the forest buffer pool.

3 The offsets usage limit falls to 4% (for emissions in years 2021–2025) and then increases to 6% (2026–2030), with no more than half of the total post-2020 usage coming from projects that do not generate "direct environmental benefits" to local air or water quality in California. Cal. Code Regs. title 17, § 95854; *see also* Health & Safety Code § 38562(c)(2)(E).

4 Health & Safety Code § 38562(d)(1).

5 Health & Safety Code § 38562(d)(2).

6 Cal. Code Regs. title 17, § 95802 (see definition of "Additional" and "Conservative").

sustainability. By shifting some climate mitigation efforts away from covered sources in California, carbon offsets could negative affect air pollution at facilities located in historically overburdened communities. California indirectly addresses this concern with the requirement that at least half of offsets provide direct environmental benefits to the state. The extent to which this requirement addresses local pollution burdens depends on how expansively CARB interprets "direct" benefits, as well as whether the benefits accrue to burdened communities.

Because California's forest carbon offsets program supplies about 80% of total offset credits in the WCI cap-and-trade program, we focus the remainder of this chapter on the performance of CARB's forest offsets protocol (CARB 2015).

**Table 2: Compliance data summary**

| Jurisdiction | Period | Emissions ($tCO_2e$) | Offsets ($tCO_2e$) | Offsets (%) |
|---|---|---|---|---|
| WCI Total | 2013–2014 | 328,160,746 | 13,096,979 | 3.99% |
| | 2015–2017 | 1,162,546,144 | 68,806,023 | 5.92% |
| | 2018–2020 | 1,090,420,561 | 76,886,203 | 7.05% |
| | Total | 2,581,127,451 | 158,789,205 | 6.15% |
| California [7] | 2013–2014 | 291,496,043 | 12,798,167 | 4.39% |
| | 2015–2017 | 986,400,626 | 62,717,868 | 6.36% |
| | 2018–2020 | 912,241,974 | 63,354,849 | 6.94% |
| | Total | 2,190,138,643 | 138,870,884 | 6.34% |
| Québec [8] | 2013–2014 | 36,664,703 | 298,812 | 0.81% |
| | 2015–2017 | 176,145,518 | 6,088,155 | 3.46% |
| | 2018–2020 | 178,178,587 | 13,531,354 | 7.59% |
| | Total | 390,988,808 | 19,918,321 | 5.09% |

[7] Compliance data are available for California at this link: https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/cap-and-trade-program-data.

[8] Compliance data are available for Québec at this link: https://www.environnement.gouv.qc.ca/changements/carbone/documentation-en.htm.

## Offset performance concerns – baselines and additionality

Recent evidence indicates that California's forest offsets program is not achieving statutory standards. In a peer-reviewed publication, Badgley et al. (2022) report an independent audit of improved forest management (IFM) forest offset projects and conclude that about 30% of credits do not reflect real climate benefits (equal to about 30 million $tCO_2e$ in the study's sample), due to problems with the regulation of projects' baseline scenarios.

An offset project's baseline scenario describes what the project says would happen, counterfactually, in the absence of income from the sale of offset credits. Because the number of offset credits a project receives is calculated based on the difference between a project's baseline and observed scenarios, projects can earn the wrong number of credits if their baseline scenarios are inaccurate or biased.

Following the challenging experience with first-generation carbon offset programs, which allowed projects to specify their own baseline scenarios without significant guidance, California adopted a "standardized approach" in which baseline methodologies are fixed in offset protocols (Haya et al. 2020). CARB's forest protocol (CARB 2015) imposes three requirements on IFM projects' baseline scenarios, which must: (1) be legally feasible (Sections 3.4.1), (2) be economically feasible (Section 5.2.1(e)), and (3) result in average carbon stocks that do not exceed regional averages known as "common practice" (Section 5.2.1(f)).

Badgley et al. showed how CARB's construction of common practice averages together dissimilar species, such that carbon-dense coastal forests earn credit for not harvesting their lands down to the carbon levels found in arid interior forests — even though different carbon levels in these two areas reflect differences in the forests' species composition, rather than the management activities projects conduct to store additional carbon. The study found evidence that project developers preferentially select projects with naturally carbon-dense species that earn extra, unjustified credits when compared against the unrepresentative regional averages found in CARB's offset protocol. This evidence indicates the baselines used in California's forest offset program are often biased.

The same study also demonstrated how offset projects construct questionable baseline scenarios that are optimized to earn maximum credits, rather than to reflect realistic or commercially reasonable scenarios (Badgley et al. 2022, Figure 2). This outcome is possible because the forest offset protocol's legal and economic feasibility requirements allow for any baseline scenarios that *could* happen, without regard to whether the scenario is likely to happen. A project does not have to show that the baseline scenario is the most profitable land use activity, nor that the baseline scenario represents typical management practices for a given

forest type. As a result, it is possible for projects to select scenarios that are unlikely to occur, but nevertheless legally and economically feasible, and therefore eligible for crediting.

We note that CARB (2021b) disputes the results of Badgley et al. (2022),[9] which have been published in a peer-reviewed academic journal. The same journal invited a commentary from independent scientists who endorse the continued use of forest carbon offsets and describe the study's results as a "call to action to redouble efforts at integrating the latest carbon science into effective and timely policy solutions" (Anderson-Teixeira & Belair 2022).

Additional in-depth reporting from investigative journalists has uncovered evidence that raises questions about whether entire projects are non-additional — in other words, projects that appear to be earning credit for business-as-usual land management activities. For example, a large project in Alaska earned millions of offset credits because it claimed to avoid significant harvests, only a few years before the landowner announced the end of all logging on its lands.[10] Similarly, nonprofit conservation groups have enrolled lands in the forest offsets program that had long been conserved, raising questions about how likely those lands were to be subject to the harvests claimed in their baseline scenarios.[11]

## Offset performance concerns – permanence

A second important challenge facing carbon offsets concerns the statutory permanence requirement, as the IEMAC discussed in an earlier report (IEMAC 2018, Chapter 5). CARB's regulations define the statutory term "permanent" as requiring only 100 years of protection.[12] Thus, fossil carbon emissions can be justified in California's program by forest offset projects that are required to protect their carbon for a term of only 100 years.

To protect against the possibility that trees might die due to fire, drought, disease, and other impacts over the next 100 years, CARB's forest offset protocol implements a buffer pool. Each

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9 CARB's disagreement with the authors focuses primarily on the algorithm the authors used to classify forests, and the use of species-specific comparisons in place of aggregation to calculate average carbon stocks.

10 Paul Koberstein and Jessica Applegate, Carbon Conundrum, *Earth Island Journal* (Winter 2021) (questioning the additionality of Sealaska's IFM project); Jacob Resnick, Sealaska Corporation says it's quitting logging, *Alaska Public Media* (Jan. 12, 2021) (reporting Sealaska's subsequent decision to end all logging).

11 Lisa Song and James Temple, A Nonprofit Promised to Preserve Wildlife. Then It Made Millions Claiming It Could Cut Down Trees, *ProPublica* and *MIT Technology Review* (May 10, 2021) (reporting on a Massachusetts-based conservation organization hosting a California forest offset project). This phenomenon has also been documented in the voluntary carbon offsets market. Ben Elgin, These Trees Are Not What They Seem, *Bloomberg Green* (Dec. 9, 2020).

12 Cal. Code Regs. title 17, § 95802 (defining "permanent" as a requirement that "all credited reductions endure at least 100 years"). However, carbon dioxide emissions from fossil fuel use remain in the atmosphere for hundreds to thousands of years (Archer et al. 2009) and have impacts that are effectively permanent in geologic time (Pierrehumbert 2014).

project contributes a share of the credits it earns to the buffer pool based on a series of risk factors (CARB 2015, Appendix D), with typical contributions in the range of 15-20%. In the case of an "unintentional reversal" — such as a wildfire — affected offset projects verify their carbon losses within 23 months and CARB retires an equal number of credits from the buffer pool.[13] So long as the buffer pool has credits remaining, the environmental integrity of the credits in circulation is preserved and the system is kept whole.

Unfortunately, the record 2020 and 2021 wildfire seasons raise concerns about whether the buffer pool is adequately capitalized to protect against future risks. The buffer pool contains about 30 million credits (CARB 2022) but will soon recognize significant losses due to several carbon offset projects that burned in the last two years. The Climate Trust (2021) estimates these losses could be up to 6.8 million credits, or more than a fifth of the credits set aside to protect against 100 years of risk. Although wildfire and other forest mortality risks vary geographically and are expected to increase with climate change, California's buffer pool does not account for either factor (Anderegg et al. 2020). Thus, there are important questions about whether the buffer pool is large enough to achieve CARB's 100-year permanence standard.

## Options for reform

If policymakers decide that California's forest offsets program is not producing credits that meet statutory standards, there are several options they could consider for reform. Each takes a different approach to correcting for problems with offset credits while also preserving the status quo policy objective of funding climate mitigation projects outside of capped sectors.

First, policymakers could identify the scale of non-additional or otherwise non-compliant crediting and reduce future allowance budgets via an *ex-post* cap adjustment. This approach would preserve the overall environmental integrity of the cap-and-trade program while recognizing the challenges associated with precisely determining offsets' emissions outcomes via standardized *ex ante* methods. Such an approach could also be conducted periodically to ensure that any future imperfections are identified and corrected. An *ex-post* assessment could also tally the measure and distribution of direct environmental benefits that are associated with offset use, using the State's environmental justice screening tool to provide information for possible reform of program requirements if needed.

Second, policymakers could adopt the approach taken by Washington State in its recent cap-and-trade legislation, which effectively includes an *ex-ante* allowance budget adjustment. Instead of enabling offset usage "above" (or in addition to) allowance budgets—as is done in

[13] Cal. Code Regs. title 17, § 95983.

California—Washington decided to enable offset usage "under" program caps. Specifically, Washington's legislation provides methods for determining emissions budgets as the sum of allowances and carbon offsets, rather than by reference to the number of allowances only.[14]

Washington's alternative budgeting approach avoids an important fragility common to conventional carbon offsetting programs: to do no harm, conventional offsets must perfectly calculate climate benefits. In contrast, offset credit imperfections do not undermine climate mitigation policy goals under Washington state's paradigm. Because Washington's allowance budget is defined such that the supply of allowances plus offsets is intended to achieve a statewide emissions target, offset use is factored into the determination of the total pollution budget provided to covered emitters. As a result, the allowance budget design anticipates the possibility that offsets could be imperfect and fully contains that possibility with an *ex-ante* cap adjustment. One potential concern with this approach is that it would not prevent low-quality offset credits, but merely contain their consequences. This outcome could indirectly dilute quality standards in voluntary carbon offset markets, which often compare their private standards to public methodologies.

Third, policymakers could replace the carbon offsets program with public expenditures funded through the Greenhouse Gas Reduction Fund. Like the "under-the-cap" approach taken in Washington, this approach would eliminate the need for projects to perfectly calculate climate benefits. Policymakers could continue to use and refine offset credit protocols to estimate the climate benefits of participating projects, but would not issue credits to projects; instead, they would directly fund those projects they deem eligible and worthy. This alternative would provide policymakers with a significantly greater degree of control over the sectors and approaches they desire to support, including the ability to concurrently recognize or prioritize multiple ecological, historic, and community development factors.

Finally, Washington's legislation provides authority to its climate regulator to limit an individual polluting facility's ability to use offsets if that facility "has or is likely to … contribute substantively to cumulative air pollution burden in an overburdened community."[15] Although we have not addressed concerns about the relationship between offset use and environmental justice in California's program here, we note that Washington's law includes a provision that speaks to this issue and is not present in California's policy system.

[14] RCW 70A.65.070(2), https://app.leg.wa.gov/RCW/default.aspx?cite=70A.65.070.
[15] RCW 70A.65.170(3)(d), https://app.leg.wa.gov/RCW/default.aspx?cite=70A.65.170.

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