

CARBON OFFSETS & NET-ZERO CLIMATE TARGETS

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Baseline scenario: what would have happened, counterfactually, with the carbon offset project. Cannot be directly observed.

Project scenario: what actually happens with the carbon offset project. Subject to measurement, reporting, and verification (MRV).

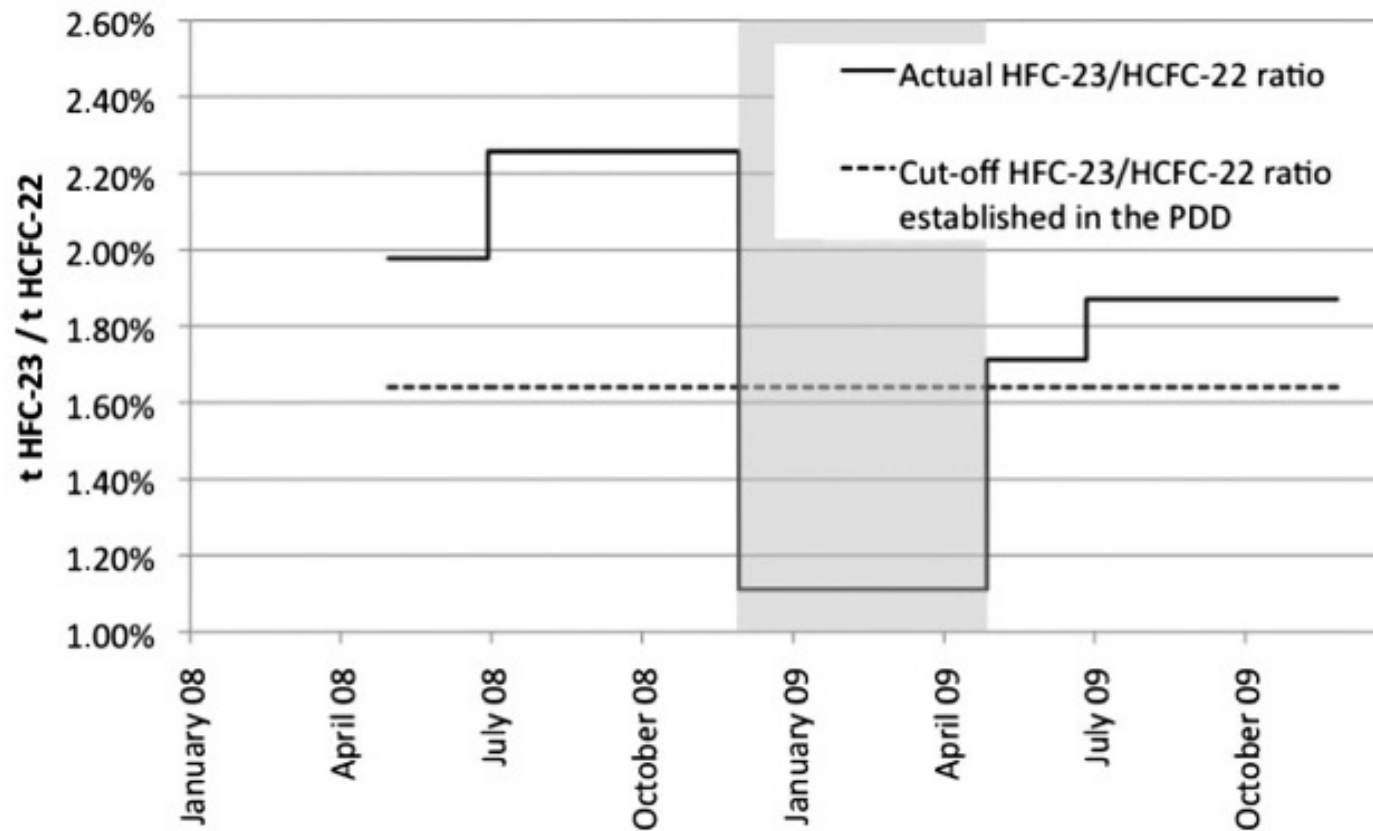


FIGURE 4 HFC-23/HCFC-22 ratio during the crediting period for project 1105

Note: The last monitoring report has been uploaded to the UNFCCC website but CERs have not yet been issued.

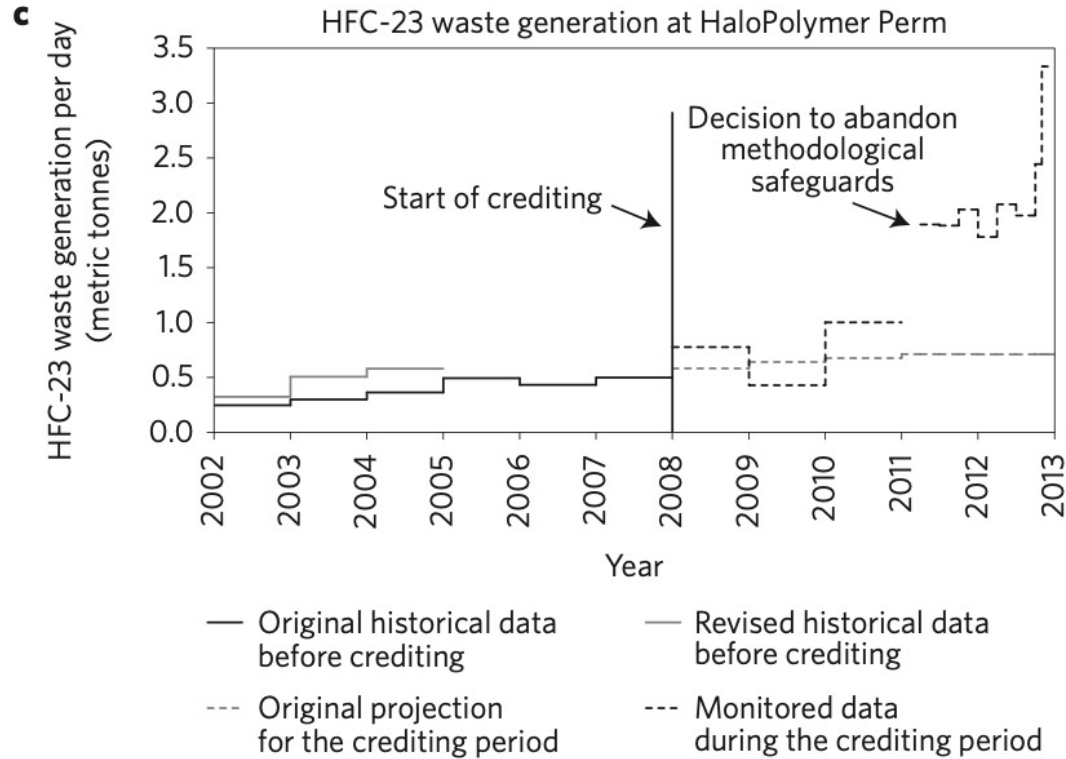


Figure 1 | HFC-23 and SF₆ waste generation at three plants in Russia. **a**, HFC-23 waste generation at the KCKK Polymer plant. **b**, SF₆ waste generation at the KCKK Polymer plant. **c**, HFC-23 waste generation at the HaloPolymer Perm plant. Waste generation increased in all three plants beyond previously reported levels when plant operators decided in 2011 to abandon methodological safeguards to prevent perverse incentives.

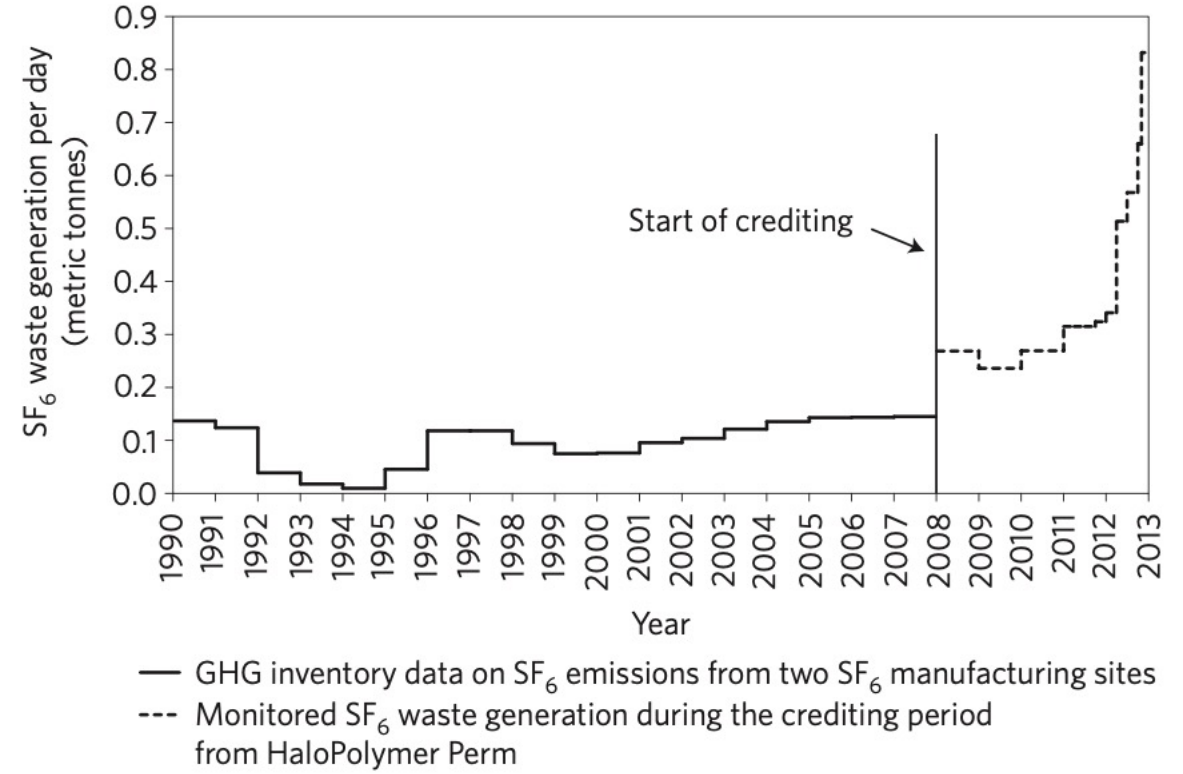
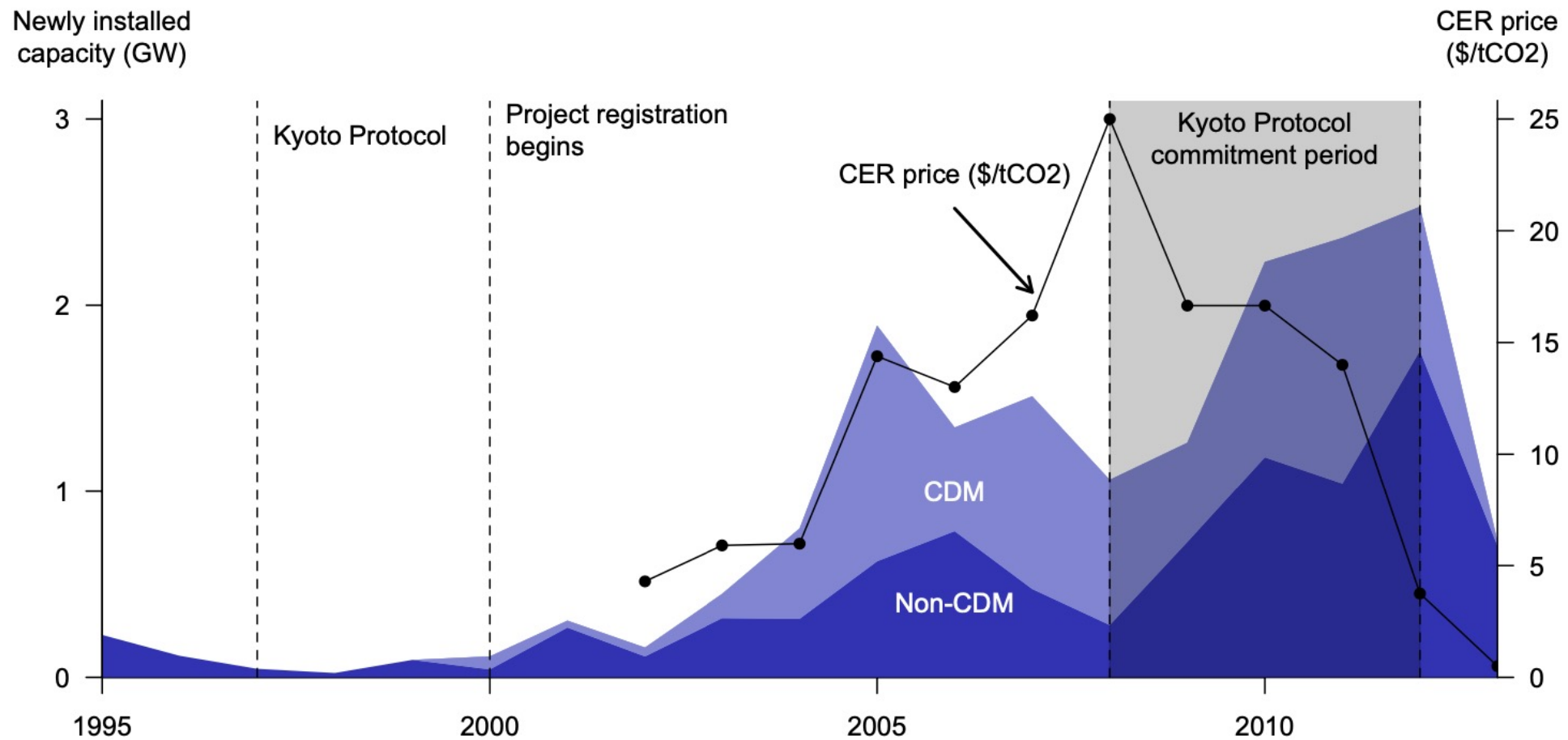


Figure 2 | SF₆ waste generation at the HaloPolymer Perm plant. The GHG inventory data includes emissions from both SF₆ production plants in Russia (KCKK Polymer and HaloPolymer Perm). After the start of crediting, the waste generation from HaloPolymer Perm increased beyond historical emission levels reported in the Russian GHG inventory from both plants.

BLIMP: Bigger, windier, closer (~50%)



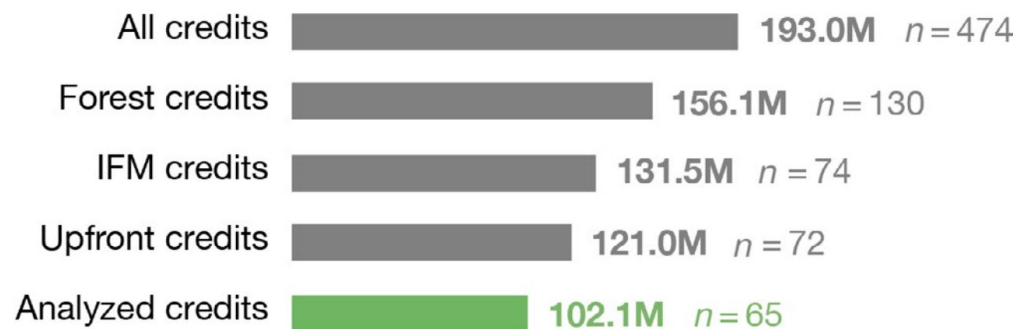
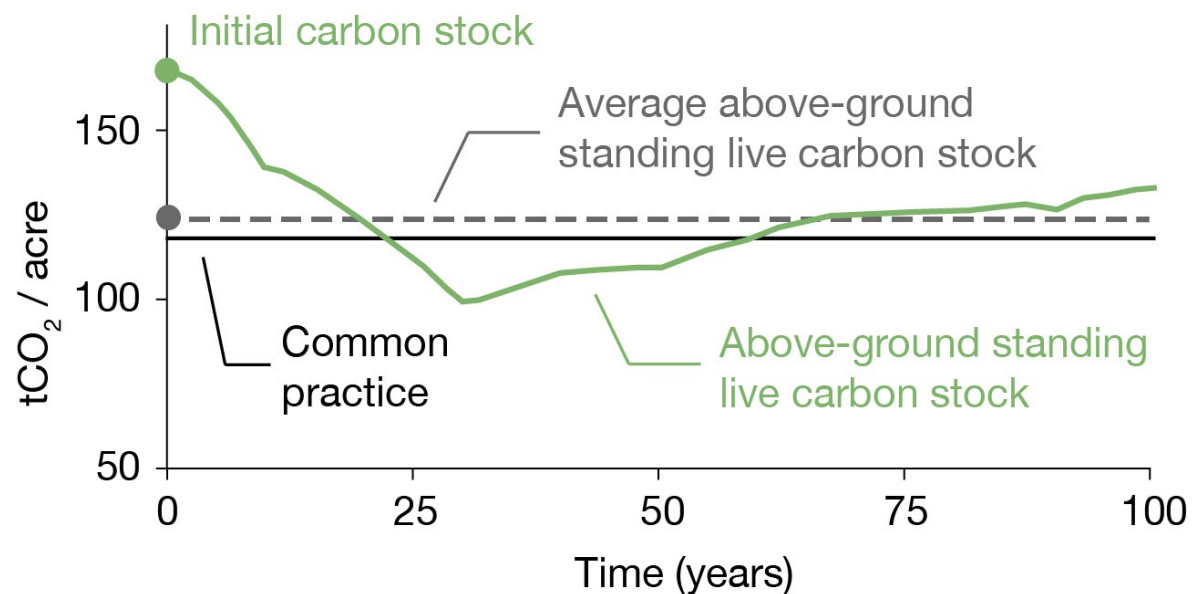
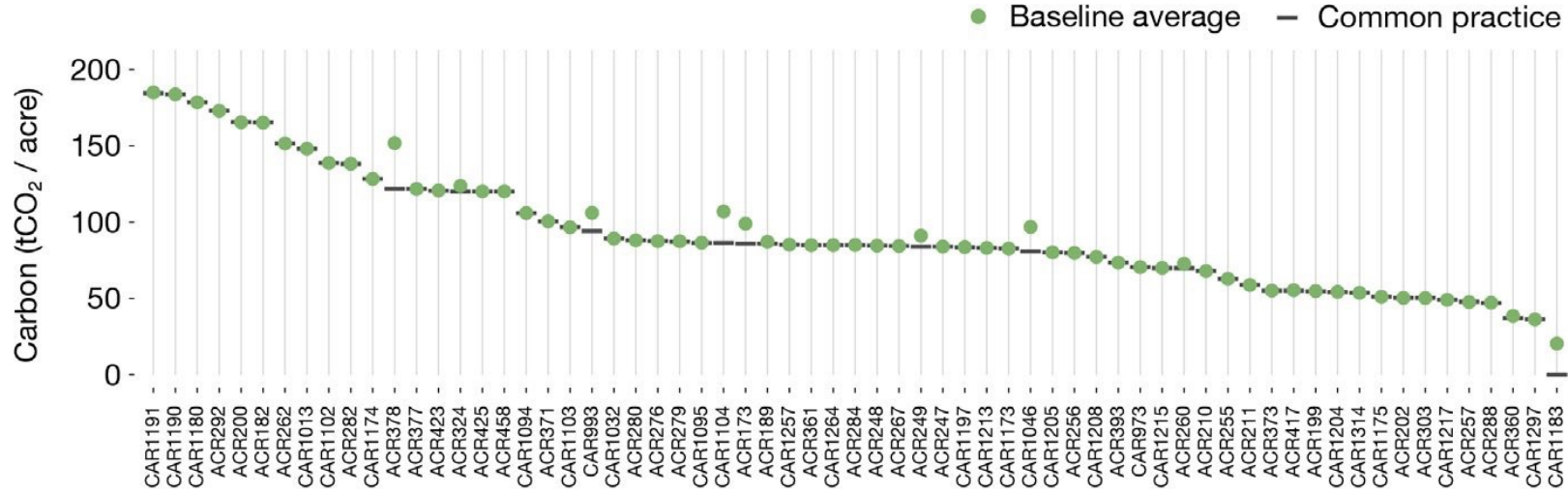
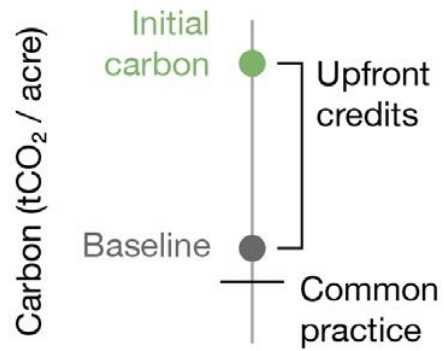


FIGURE 1 California's carbon offsets program. As of our study cutoff date of September 2020, the California Air Resources Board had issued 193 million offset credits, each worth 1 tCO₂e, to 474 projects. The forest offsets protocol accounts for the vast majority of credits in the program, with most credits awarded to improved forest management (IFM) projects and most IFM credits earned in the form of initial, upfront credits calculated under standardized protocol rules. Limited public data disclosures restrict our analysis to 65 projects that earned 102.1 million upfront IFM credits, equivalent to about two-thirds of the forest offsets program or about half of California's total offsets program

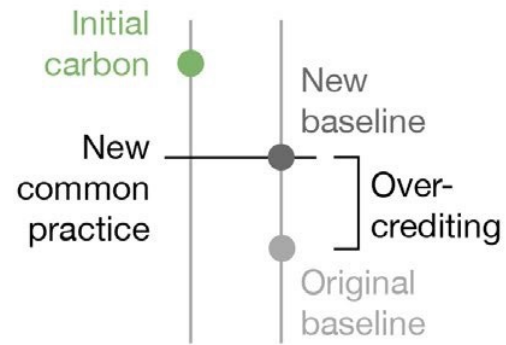




(a) Crediting calculations



(b) Over-crediting



(c) Under-crediting

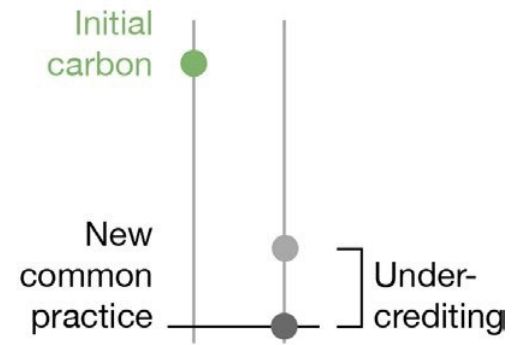




Photo: TJ Watt / CBC



Photo: Woodland Fish & Wildlife

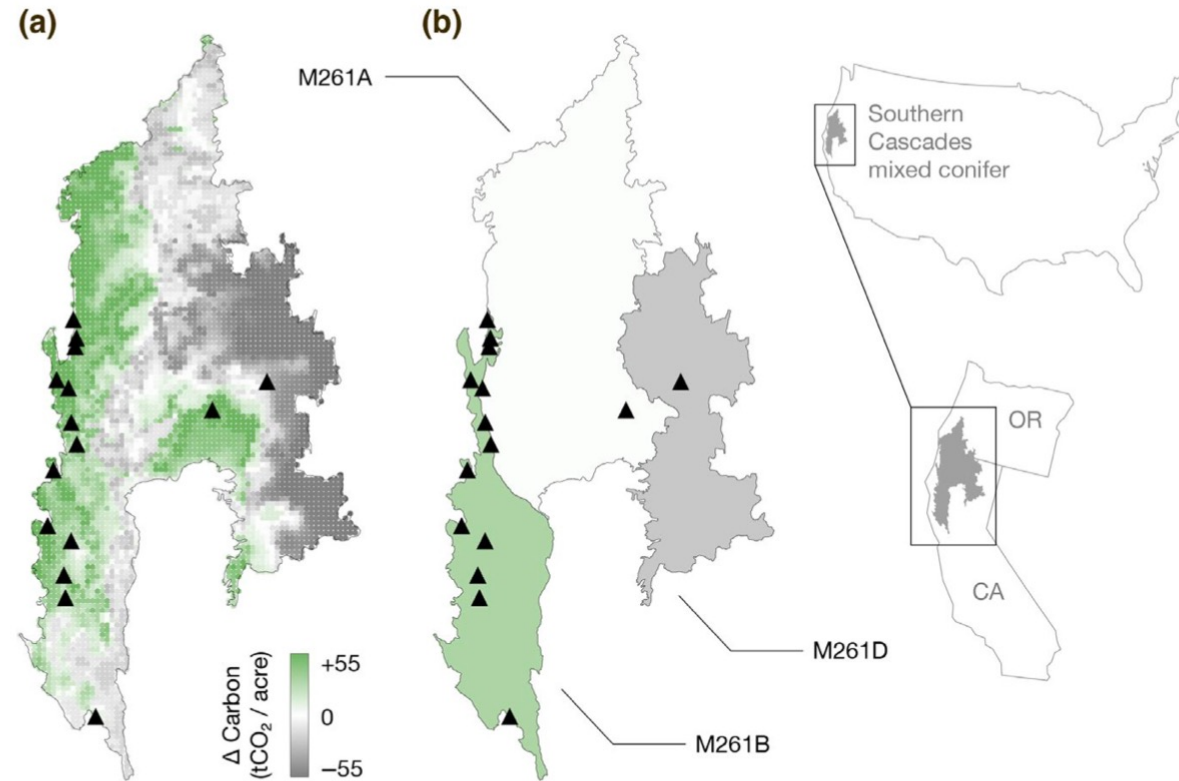
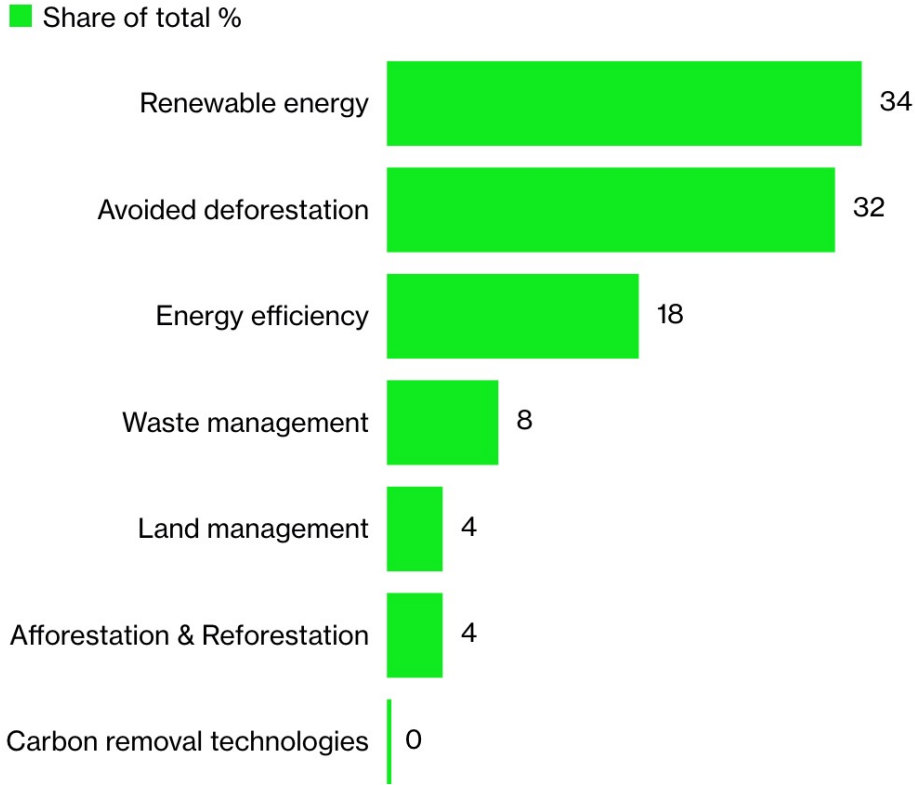


FIGURE 6 Arbitrage patterns in the Southern Cascades mixed conifer assessment area. One of the most extreme examples of over-crediting occurs in the mixed conifer assessment area of the Southern Cascades supersection. (a) The difference between standing live aboveground forest carbon in FIA plots that are climatologically similar to local conditions, and the supersection-wide average of all plots (see Extended Methods). Projects, represented with black triangles, cluster in carbon-rich areas, notably in wetter climates near the coast where carbon-dense forests grow. (b) The difference between ecosystem- and supersection-wide common practice for mixed conifers. Three ecosystems with distinct local carbon patterns were combined together to generate a supersection-wide common practice number that distorts ecological reality. The most carbon-rich ecosystem (M261B) contains most of this supersection's offset projects, which earn credits based on comparisons against supersection-wide averages that include dryer and less temperate ecosystems (M261A, M261D)

	Rigor	Additionality	Durability	Safeguards	Rating
ACR C	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
ACR G	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
Alb Cr*	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
Aus Est*	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
Aus Meas*	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
BCarbon	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
CAR Soil	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
FAO	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
Gold Std	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
Nori	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
Plan Vivo	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
Regen	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
Verra FG	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
Verra IA	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
Verra Soil	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
Verra SA	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓
Verra SG	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	✓ ✓ ✓ ✓ ✓

Paltry Offering

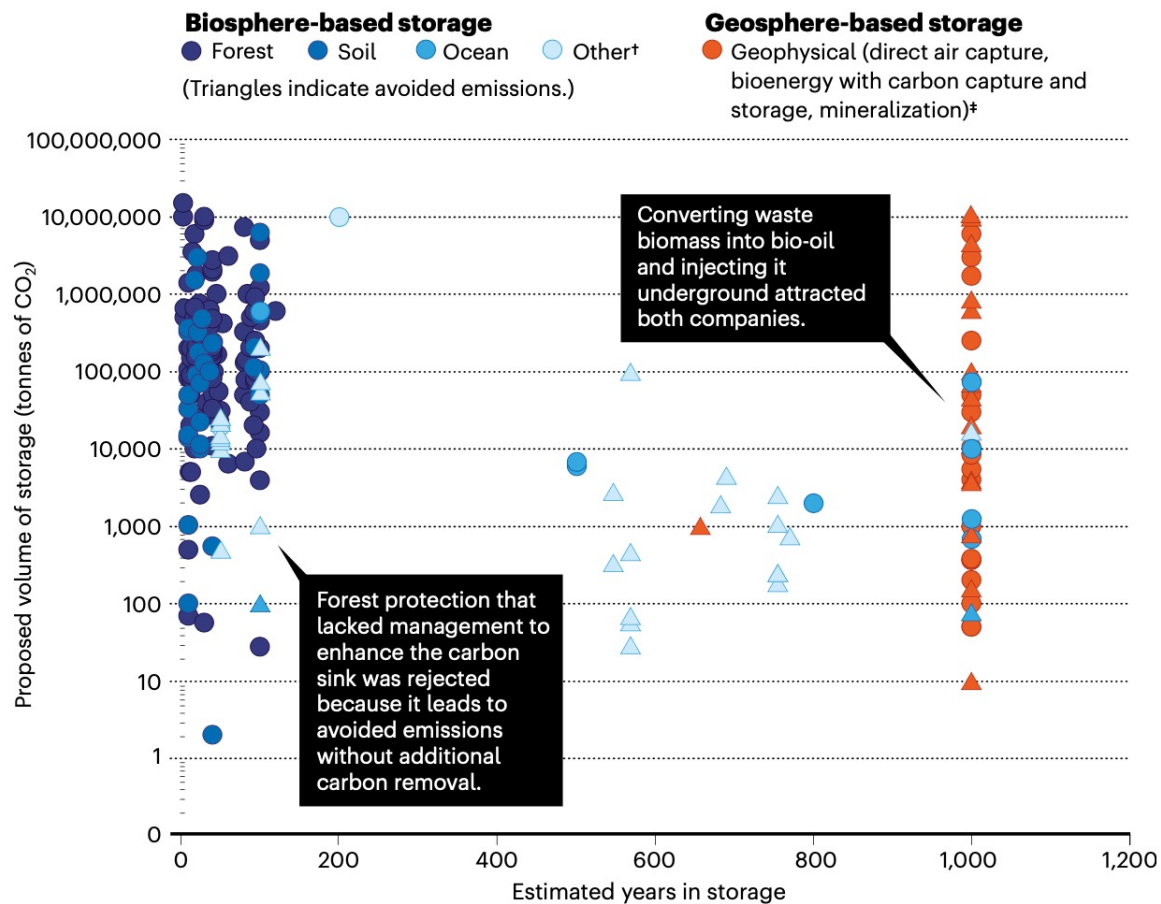
Less than 5% of offsets actually remove carbon dioxide from the atmosphere



Source: TSVCM inventory analysis for 2020
Note: Avoided emissions credits prevent hypothetical polluting activity

CARBON-MARKET SNAPSHOT

In 2020, Microsoft and financial-services firm Stripe received 189* and 47 proposals from companies, respectively, for locking away carbon dioxide. Of these, 95% used nature-based storage, which is less durable than geosphere-based. Few options were available for permanent removal. Only about 2 million tonnes' worth was judged reliable enough to purchase, of the around 170 million tonnes offered.



*Data on 161 proposals compiled by CarbonPlan (<https://carbonplan.org>); these exclude 28 further proposals to Microsoft that lacked sufficient information.

†Biomass, wood products and biochar. *Many geosphere-based solutions were classified as >1,000 years duration, but are shown here as 1,000 years for simplicity.

“Today’s pricing on a per-tonne basis encourages companies to buy the lowest-quality carbon offsets. It does not monetize the duration of carbon storage, the risk of premature release, or the social equity or environmental benefits of removal.”

CDR Database

These are reports on public Carbon Dioxide Removal project proposals. Built for transparency. Download as a [JSON](#) or [CSV](#) (licensed as [CC-BY](#)). Read our [methods](#).

- SEARCH
- CATEGORY [ALL](#) [FORESTS](#) [SOIL](#) [BIOMASS](#) [OCEAN](#) [MINERALIZATION](#) [DAC](#)
- SOURCE [STRIPE](#) [MICROSOFT](#)
- YEAR [2020](#) [2021](#)
- MECHANISM [REMOVAL](#) [AVOIDED](#)
- RATING

FILTER BY METRICS

- + VOLUME tCO₂
- + PERMANENCE years

TOTAL **219** FILTERED **012** VOLUME **9.9M**

44.01 + [MINERALIZATION](#) [INJECTION](#)
 CO₂ storage via injection and mineralization in peridotite.
 Stripe Fall 2021 / Oman

CarbonBuilt + [MINERALIZATION](#) [CONCRETE](#)
 Startup commercializing a low-cost, scalable, low-carbon concrete technology.
 Stripe Spring 2021 / USA

Charm Industrial + [BIOMASS](#) [INJECTION](#)
 Geological sequestration of bio-oil.
 Microsoft 2021 / Kansas, USA

Climeworks + [DAC](#) [MINERALIZATION](#)
 Direct air capture and mineralization.
 Microsoft 2021 / Reykjavik, Iceland

Eion Corp + [MINERALIZATION](#) [OLIVINE](#)
 Olivine mineralization in agricultural applications.
 Stripe Fall 2021 / Princeton, NJ and Berkeley, CA

Carbon Engineering + [DAC](#) [INJECTION](#)
 Global opportunities for affordable, scalable DAC and storage at climate-relevant volumes.
 Microsoft 2021 / Global

Charm Industrial + [BIOMASS](#) [INJECTION](#)
 Geological sequestration of bio-oil.
 Stripe 2020 / CA, USA

Climeworks + [DAC](#) [MINERALIZATION](#)
 Direct air capture and mineralization.
 Stripe 2020 / Iceland

CO₂-Zero + [MINERALIZATION](#) [OLIVINE](#)
 Surface olivine weathering.
 Stripe Spring 2021 / Turkey

Future Forest + [MINERALIZATION](#) [BASALT](#)
 Enhanced weathering for carbon removal.
 Stripe Spring 2021 / United Kingdom

Why we can't count on carbon-sucking farms to slow climate change

Even though lots of politicians, environmentalists, and companies are eager to try.

By James Temple

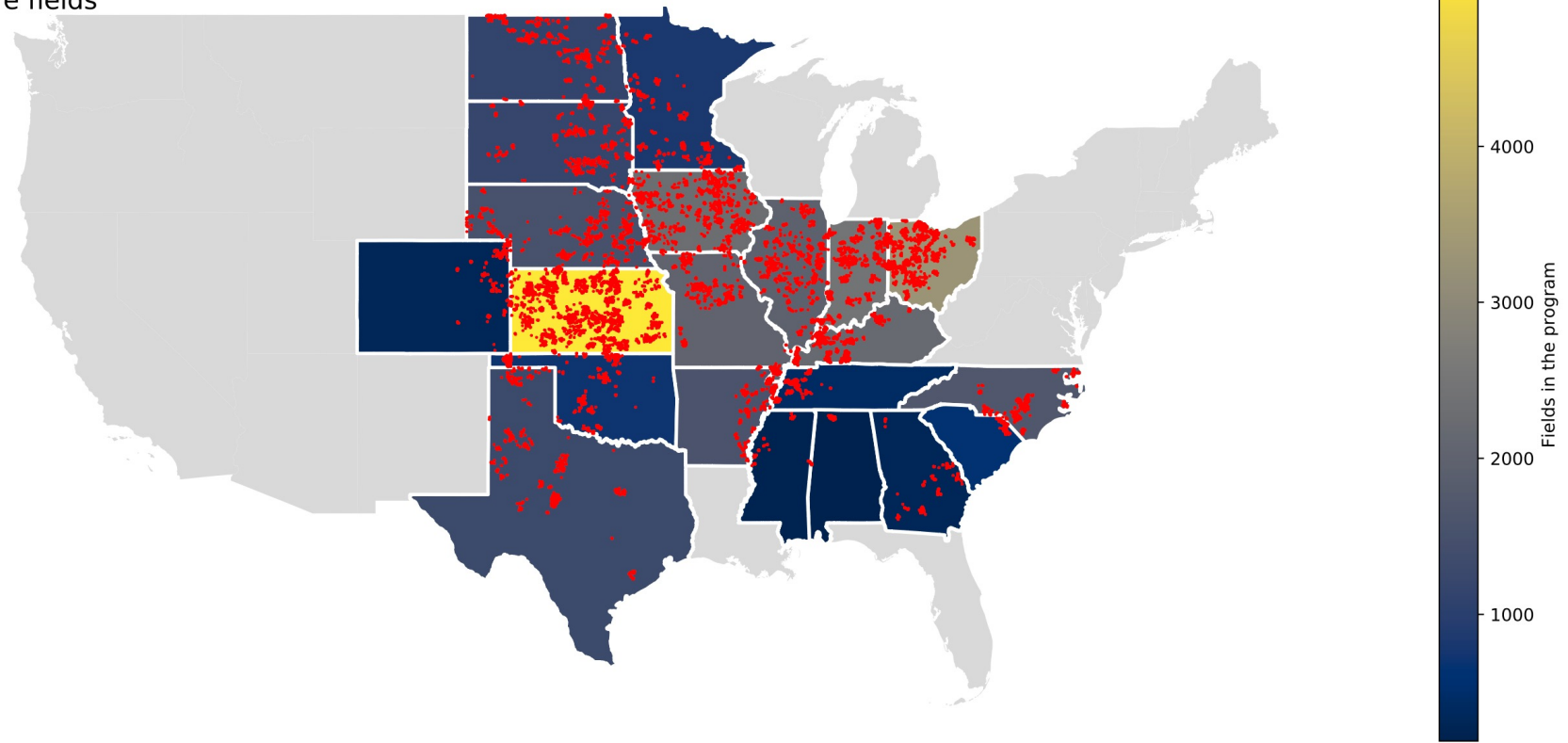
June 3, 2020

At least one argued that conflicts of interest may have swayed the process, because Indigo Agriculture contributed an unspecified amount of money, as well as “research and drafting support.” The company works with farmers to pool soil carbon credits that it then sells to corporations and nonprofits, so it has a clear stake in how the standards are set.

“A sponsored protocol development process raises concerns about the integrity of the proposed methods,” reads a response letter from CarbonPlan, a new nonprofit that evaluates the scientific rigor of carbon removal efforts. “That concern is particularly important because many of the critical methodological options in the draft protocol are not fully specified and are instead left open to the design and determination of project owners —presumably including the reserve’s financial sponsor, Indigo Ag.”

Indigo 2020 vintage project location

Red dots are fields



Map current as of November 2020

In response to your second question, you are correct that Indigo Ag did recently provide us with a list of workgroup members and whether or not each individual had ever had any financial relationship with Indigo Ag. A summary of this information is provided below and we also plan to publish this information on our website. According to Indigo Ag, the aggregate compensation for these five engagements was \$90,000 (excluding Max DuBuisson’s compensation).

Kozyra		
Keith Paustian	Colorado State University	None
Ken Newcombe	C-Quest Capital	Informal advisor to Indigo as it builds its carbon business
Matt	World Resources	None

Keith Paustian – founder of Soil Metrics and part of Nobel-winning IPCC team – joins company as advisor

October 26, 2021 (BOSTON) — **Indigo Agriculture**, a company leveraging nature and technology to unlock economic and environmental progress in agriculture, today announced a deepened commitment to advancing discovery in soil carbon science, enabled by the acquisition of **Soil Metrics** — an industry-leading technology for comprehensive soil carbon and greenhouse gas (GHG) assessment in agricultural soils. The strategic investment reaffirms Indigo’s commitment to the rigorous scientific process underlying soil environment measurement and will further enhance and scale the premier carbon measurement, reporting, and verification (MRV) system powering its industry-leading carbon farming program to maximize profitability and sustainability benefits for growers.

METHOD
 MOURA COSTA LASHOF

TIMESCALE
 100 YEARS 1000 YEARS

TIME HORIZON
 100 years

STORAGE PERIOD
 1 years

DISCOUNT RATE
 0.00 percent

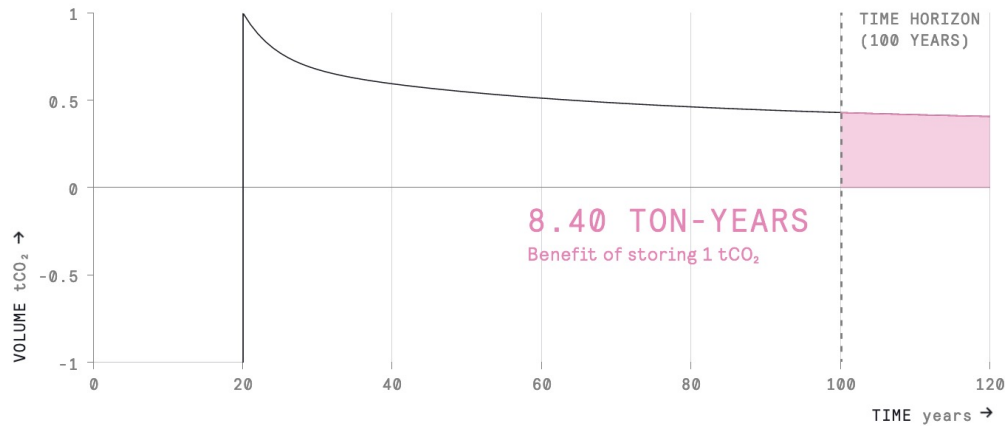


FIGURE 4 / Different ton-year methods produce different claims about the benefit of the same temporary carbon storage. For a project that stores 1 CO₂ for 20 years before re-emitting it to the atmosphere and a 100 year time horizon, Moura Costa calculates a 20 ton-year benefit while Lashof calculates an 8.4 ton-year benefit. The timescale toggle provides context for how a 100 year time horizon compares to the long-lived nature of atmospheric CO₂.

TON-YEAR COST OF 1 tCO₂ EMISSION

52

TON-YEAR BENEFIT OF TEMPORARY STORAGE OF 1 tCO₂

1 (Moura Costa)

0.410 (Lashof)

STORAGE AMOUNT NEEDED TO OFFSET 1 tCO₂ EMISSION

52 (Moura Costa)

128 (Lashof)

IMPACT ton-years →

EQUIVALENCE RATIO unitless →

SOURCE	NCX (2020)	NCX (2021)	CAR (2020)	Lashof Example
TIME HORIZON years	100	1000	100	100
STORAGE PERIOD years	1	1	1	1
DISCOUNT RATE percent	3.30%	3.30%	0%	0%
EQUIVALENCE RATIO unitless	17	30.8	100	128

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FEB 08 2022

Why carbon offset disclosure matters

BY
SADIE FRANK +
DANNY CULLENWARD +
FREYA CHAY



Interest in net-zero-aligned investing is significant and growing. BlackRock, the largest asset manager in the world, recently wrote in a client letter that “the issue ... is no longer whether the net zero transition will happen but how.” Financial-industry-led coalitions managing trillions of dollars have committed to net-zero climate targets that will be implemented via net-zero transition plans.

The most critical element of a credible net-zero plan is a company’s strategy for rapidly cutting its own emissions. But the pace and extent of promised mitigation is often conditioned on a company’s view about the extent to which it can rely on carbon offsets, which are a common part of net-zero plans.

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Compliance users

/ QUICK LOOK

Tracking the users of compliance offsets

In the California cap-and-trade program, polluting entities use carbon offsets for compliance. Who are they? This tool lets you search for an offset project, user, or facility, and see the linked results. Read more in our [blog post](#) or checkout the [GitHub repository](#).

🔍 PROJECT USER FACILITY Finite Carbon - Sealaska Native Alaskan IFM × 42

ID: **ACR324**
NAME: FINITE CARBON - SEALASKA NATIVE ALASKAN IFM
TYPE: U.S. FOREST PROJECT

SHOW RESULTS BY [USER](#)

REPORTING PERIODS
[2013-2014](#) [2015-2017](#) [2018-2020](#)

USER ID: [CA1019](#) ↗
USER NAME: AIR LIQUIDE LARGE INDUSTRIES U.S., LP
REPORTING PERIOD: 2015-2017
QUANTITY: 110,000

USER ID: [CA1029](#) ↗
USER NAME: SOUTHERN CALIFORNIA EDISON COMPANY
REPORTING PERIOD: 2018-2020
QUANTITY: 45,440

USER ID: [CA1046](#) ↗
USER NAME: PACIFIC GAS AND ELECTRIC COMPANY
REPORTING PERIOD: 2015-2017
QUANTITY: 183,366

USER ID: [CA1054](#) ↗
USER NAME: SIGNAL HILL PETROLEUM, INC.
REPORTING PERIOD: 2018-2020
QUANTITY: 8,000

	Offset model	Expenditure model
Type	Quantity	Quality
Metric	Count tons	Count dollars
Goal	Seek lowest cost	Seek quality
Key strength	Easy to count tons	Can pursue and mix multiple goals
Key weakness	“All tons are the same”	Quality is expensive; supply is limited

Additional reading

Ben Elgin, [These Trees Are Not What They Seem](#), *Bloomberg Green* (Dec. 9, 2020)

Stephen Stapczynski, Akshat Rathi, and Godfrey Marawanyika, [How to Sell 'Carbon Neutral' Fossil Fuel That Doesn't Exist](#), *Bloomberg Green* (Aug. 10, 2021)

Lisa Song & James Temple, [The Climate Solution Actually Adding Millions of Tons of CO₂ Into the Atmosphere](#), *ProPublica & MIT Technology Review* (Apr. 29, 2021)

Lisa Song & James Temple, [A Nonprofit Promised to Preserve Wildlife. Then It Made Millions Claiming It Could Cut Down Trees](#), *ProPublica & MIT Technology Review* (Apr. 29, 2021)

Evan Halper, [Burned trees and billions in cash: How a California climate program lets companies keep polluting](#), *Los Angeles Times* (Sept. 8, 2021)

Camilla Hodgson & Billy Nauman, [Carbon offsets: A license to pollute or path to net zero emissions?](#) *Financial Times* (Aug. 30, 2021)

Emily Pontecorvo & Shanno Osaka, [How wildfires could unravel California's climate progress](#), *Gist* (Oct. 27, 2021)