

## Cap and Trade Market

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Authors: Erik Martig and Victoria Evans of SCS Engineers

### Overview of California's Cap-and-Trade Program

The California Greenhouse Gas Cap-and-Trade Program aims to reduce GHG emissions by applying an emission ceiling on covered entities and providing three options for meeting their reduction requirement: making an emissions reduction, purchasing allowances, or purchasing compliance carbon offset credits.

AB 32 (California Global Warming Solutions Act of 2006) requires a statewide reduction in GHG emissions through a suite of programs, including a Cap-and-Trade Program, which sets an annual declining limit on major sources of GHG emissions throughout California. California Air Resources Board (CARB) allows regulated entities to meet their compliance obligation by purchasing allowances from the State, with the option of purchasing eligible California compliance offset credits. Offset projects for compliance credit in California must be verified by a 3<sup>rd</sup> party verifier and then listed with a CARB-approved Offset Project Registry to be eligible for application in California's program. Offset credits can be generated by individual projects applying one of six CARB-approved offset protocols, as follows:

- U.S. Forest Projects
- Urban Forest Projects
- Mine Methane Capture (MMC) Projects
- Ozone Depleting Substances (ODS) Projects
- Livestock Projects
- Rice Cultivation Projects

CARB has approved the following three *Offset Project Registries* to list verified California compliance carbon offset projects for credit under the California cap-and-trade program:

- Climate Action Reserve
- American Carbon Registry
- Verra

### Who is required to cap their emissions? And by when?

Section 95811 in Title 17 of the California Code of Regulations lists the covered gases and associated entities along with inclusion thresholds that determine which types of emitters are required to comply. A sampling of those entities are cement production, petroleum refining, electricity generating facilities, natural gas suppliers, and liquefied petroleum gas suppliers. Refer to CCR Title 17 Section 95811 for a full list of California entities that must comply with the regulation.

The following gases are subject to the program:

- Carbon dioxide
- Methane

- Nitrous oxide
- Sulfur hexafluoride
- Hydrofluorocarbons
- Perfluorocarbons
- Nitrogen trifluoride
- Fluorinated greenhouse gases

According to the Air Resources Board, entities regulated by the cap-and-trade program (known as compliance entities) may use compliance carbon offset credits to meet up to 4 percent of their compliance obligation for emissions during the 2021-2025 period and 6 percent for emissions from 2026-2030. Within this allowable amount of carbon offset credits, no more than one-half may be sourced from projects that do not provide direct environmental benefits in California.

### **Offset Protocols in the California Cap-and-Trade Program**

Offset protocols are the standards that an offset project developer must meet for their offset project to receive compliance offset credits.

Waste management-related protocols include mine methane capture (MMC), ozone-depleting substances (ODS), and livestock projects. The livestock protocol is the only organics management protocol in the California cap-and-trade program.

For a project to receive compliance offsets, the project must receive verification from an approved third-party verification body, such as SCS Engineers. The verification process ensures that offsets are real, quantifiable, enforceable, permanent, additional, and comply with the protocol's written requirements.

### **Livestock Protocol**

As noted earlier, an applicant must follow offset protocols to become an offset project and receive offset credits. The protocol for livestock projects is intended to quantify the GHG reductions associated with installing a biogas control system (BCS) for manure management on dairy and swine farms. Projects that install a BCS to capture and destroy methane from anaerobic manure treatment on livestock operations are eligible.

One downside to this protocol is its narrow focus on capturing and destroying methane. Projects that avoid the generation of methane are not provided within the protocol. The Final Recommendations report authored by the Compliance Offsets Protocol Task Force, which required CARB to examine its protocols under a 2017 assembly bill, notes this shortcoming.

### **Opportunities for Livestock Projects**

Agriculture-based project opportunities include livestock waste management with anaerobic liquid-based systems (e.g., in lagoons, ponds, tanks, or pits) to capture and destroy methane. The project location does not need to be in California to be eligible for this protocol. SCS has verified several New York and Indiana livestock projects that are participating in the California program.

The top dairy-producing states, according to the United States Department of Agriculture (USDA), are:

1. California
2. Wisconsin
3. Idaho

4. Texas
5. New York

The top swine-producing states, according to USDA, are:

1. Illinois
2. Minnesota
3. North Carolina
4. Illinois
5. Indiana

#### **Can a new protocol be drafted?**

Yes, new protocols can be adopted by CARB, but the duration from proposal to adoption is lengthy. Our climate change expert served on a technical working group for the rice cultivation protocol and noted that the process took 18 months. Developing a new protocol would be under the same public rulemaking process that CARB undertakes for all regulations and amendments.

In 2017, Assembly Bill 398 required CARB to establish a Compliance Offsets Protocol Task Force to identify potential protocols that could be added to the Cap-and-Trade program to increase the number of offset projects. The task force published a final report on March 2, 2021, with recommendations to CARB on possible protocols to adopt. The report mentions several protocols that expand on the role of organic management and the products derived from organic management in reducing greenhouse gas emissions. Of note are the following:

- Diversion/conversion of cattle manure storage from anaerobic to aerobic systems
- Compost application to grazed grassland

The report notes that California has two landmark programs aimed at reducing emissions from livestock manure: the Dairy Digester Research and Development Program (DDRDP), which focuses on anaerobic digestion projects, and the Alternative Manure Management Program (AMMP), designed for composting projects. These programs receive funding from the Greenhouse Gas Reduction Fund (GGRF), which receives funds from the sale of offset credits.

The AMMP program, which provides financial assistance for developing non-digester manure management practices on dairy and livestock operations in California, continues to be oversubscribed, resulting in a bottleneck for further reductions in methane emissions. With such demand, the task force found that a regulatory offsets program could provide significant funding to support the conversion from anaerobic to aerobic manure management practices. The task force ultimately recommended that the CARB pursue modifying the existing CARB Livestock Protocol to provide offsets for projects pursuing aerobic management practices found in the AMMP program.

The task force also examined the application of compost to grazed grassland. Their analysis found that the practice is not economically feasible at this time. As a result, the task force did not recommend adopting a protocol for compost application to grazed grassland.

#### **Financial Incentive**

Since the Cap-and-Trade Program's inception, over 595 California compliance offset projects have been issued credits for livestock projects. On average, projects were issued 15,600 credits. As of July 2023, allowance credits were trading around \$33 per tonne.

In 2022, ten livestock projects were issued an average of 13,877 credits. Prices ranged from \$26 to \$31 in 2022. A project receiving 13,877 credits valued at \$29 per credit would have \$402,000 in total value on the market.

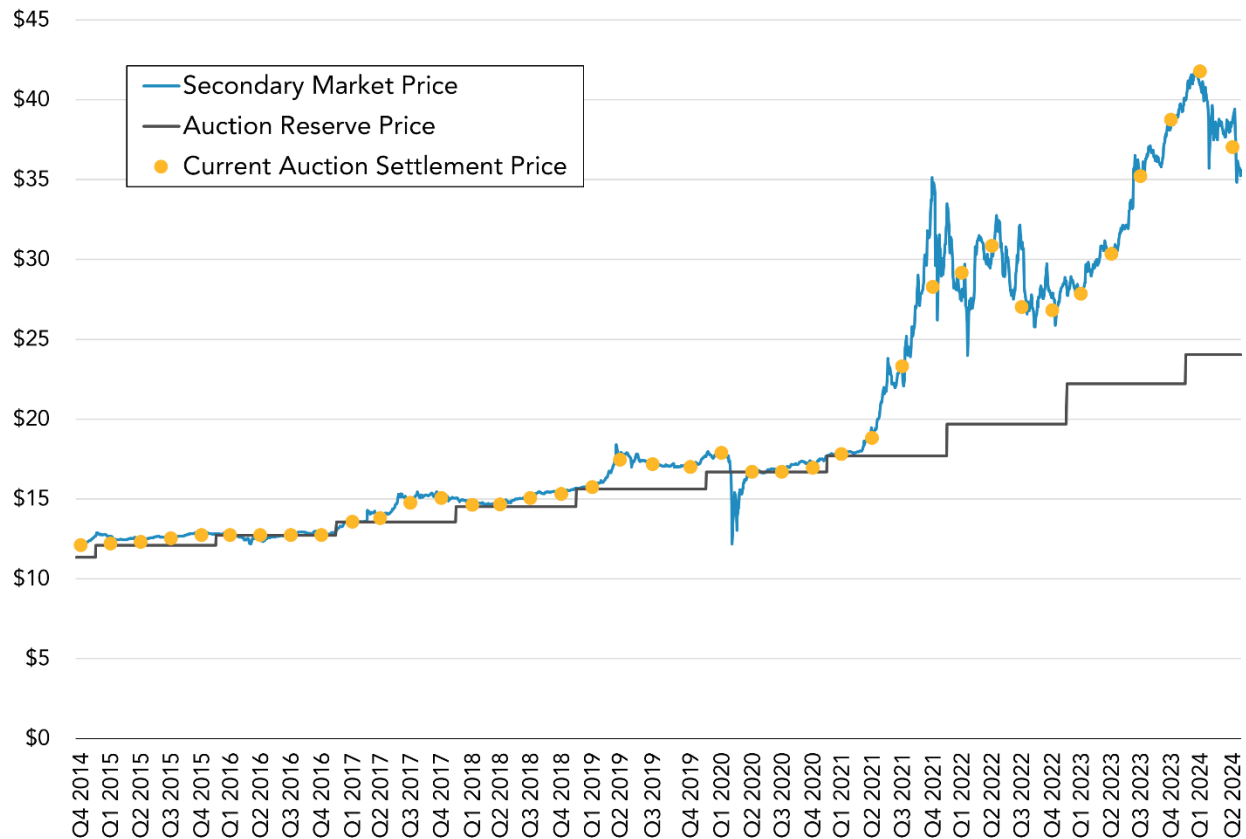


Figure 1 Carbon Allowance Prices (source: California Air Resources Board website)

The cap-and-trade program uses a floor price to maintain a carbon price signal, essentially preventing low demand from driving down the price.

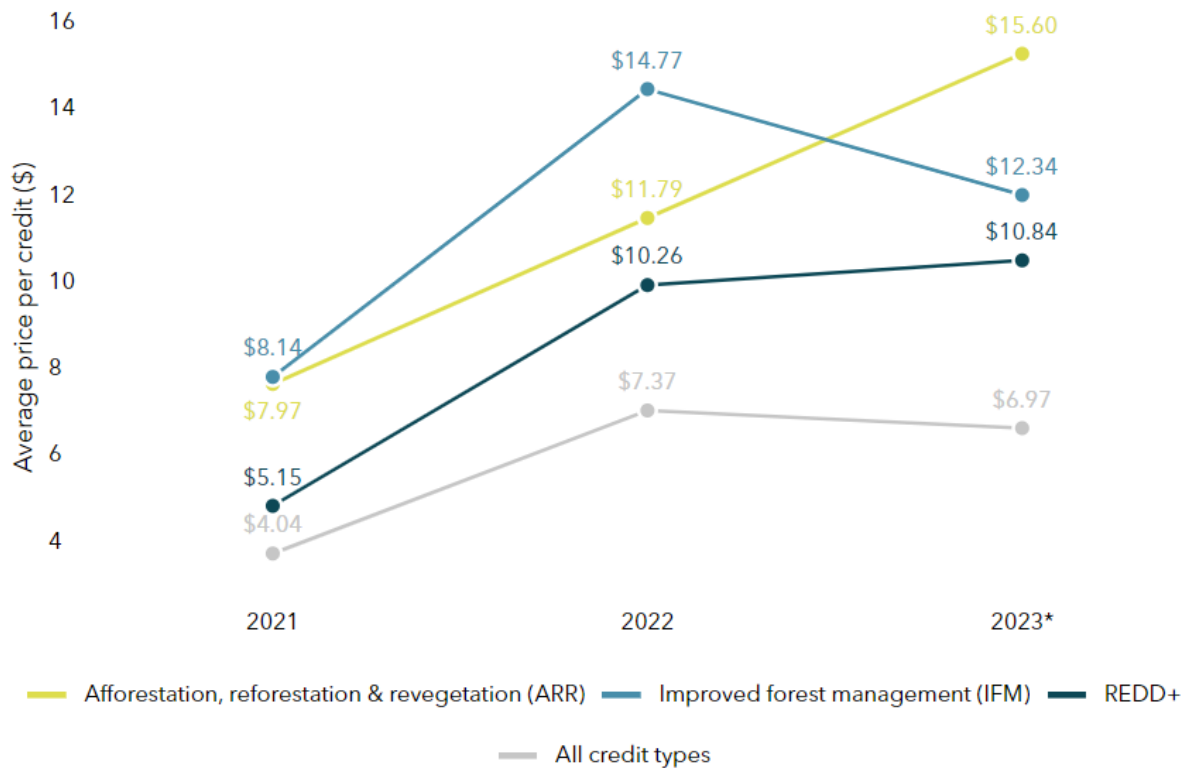
### Voluntary Markets

Carbon registries play a key role in the voluntary carbon market by developing protocols to quantify credits for a project, reviewing and verifying a project for conformance to the protocol, and operating the registry that issues and transfers credits after sale or retirement. In the United States, there are several carbon registries, with the most common being (i.e., same as those used by the California cap-and-trade program):

- Verra
- American Carbon Registry (ACR)
- Climate Action Reserve (CAR)

For projects that do not fit into the California compliance protocols, the carbon registries have developed protocols that could apply to projects. To participate in the voluntary market as an offset project, a project developer needs to research available protocols/methodologies from carbon registries or programs to evaluate applicability. If a project does not have a match for a protocol, one can be proposed to the registry. It is important to note that not all project types, registries, and

verification bodies are equal – meaning that credits issued can range in value depending on the registry, project type, and verification. Figure 2 illustrates this case by demonstrating the various credit prices based on project type.



\*2023 average price is preliminary for transactions taking place from 1 January-21 November 2023  
 Source: Ecosystem Marketplace Insights Report - Paying for Quality: State of the Voluntary Carbon Markets 2023

Figure 2 Price Fluctuations (credit: newprivatemarkets.com)  
 REDD+ is an acronym for Reducing Emissions from Deforestation and Forest Degradation

**Organics Management-Related Protocols**

Each of the three CARB-approved registries permitted to list California compliance carbon offset projects has its protocols for generating voluntary carbon offset credits via specific project types.

The *Climate Action Registry* (CAR) has 28 protocols organized into three overarching categories: natural climate solutions, waste handling and methane destruction, and industrial processes and gases.

Below, we note organics management protocols related to materials found in organics waste management economies.

- U.S. and Canada Biochar
- U.S. Soil Enrichment
- U.S. Organic Waste Composting

Verra has adopted 38 protocols and accepts some methodologies listed by CAR and Clean Development Mechanism (CDM), a carbon registry run by the United Nations. Of the 38 methodologies developed by Verra, three are related to organics.

- Improved Agricultural Land Management
- Biochar Utilization in Soil and Non-soil Applications
- Reducing Food Loss and Food Waste

The *American Carbon Registry* (ACR) lists 17 protocols covering a range of project types, from GHG reductions at industrial processes to carbon capture and storage. ACR does not have a methodology that applies to organics management or the use of compost.

This paper will go into further detail about U.S. and Canada Biochar (CAR); U.S. Soil Enrichment (CAR); and Reducing Food Loss and Food Waste (Verra). For information about U.S. Organic Waste Composting (CAR), refer to the [Climate Action Reserve Organic Waste Digestion Project Protocol](#) blog or contact [Greg McCarron](#).

Due to the similarities of U.S. Soil Enrichment (CAR) to Improved Agricultural Land Management (Verra) and the U.S. and Canada Biochar (Verra) to Biochar Utilization in Soil and Non-soil Applications, we address one of each pair in this article.

## **U.S. and Canada Biochar (CAR)**

According to CAR, three distinct phases comprise the scope of a biochar offset project under their protocol: 1) biomass acquisition, 2) biochar production, and 3) biochar application. These do not require specific configurations for the activities from each project phase. Rather, the combination of such activities must produce quantifiable climate benefits.

While this protocol encompasses the three main phases of biochar production, the feedstock acquisition and final application of the biochar appear to be the areas with more documentation for possible pathways to reduce or sequester GHG emissions.

Biomass acquisition, i.e., feedstocks for a project, must be one of the following:

- Biomass that is a waste stream
- Biomass grown for biochar production

Biochar applications may be in soil or non-soil applications, and this part of the project must ensure that the carbon contained in the biochar persists in the long term. In other words, the biochar should not be used for combustion or other end uses that release the carbon back into the atmosphere. CAR maintains a list of eligible biochar applications called the [Eligible Biochar End Uses List](#). Eligible end uses include agricultural/horticultural uses, amendment to construction materials, spent oil wells/mines, alternative daily cover on landfills, and water sanitation, among other projects.

## **Opportunities for Clients**

Bioenergy plants with residual biochar produced during combustion may recycle non-combusted biochar back into the process. An alternative to this process could take the biochar and implement an end-use application that aligns with the CAR protocol.

Biochar producers should assess their feedstocks to ensure materials derive from a waste stream or non-woody, perennial biomass intentionally grown for biochar production. CAR maintains an [Eligible](#)

[Biochar Feedstocks List](#) on its website. Note that woody waste streams produce the highest quality biochar.

Protocol adoption occurred on March 19, 2024. There are no projects of this type currently listed on CAR's registry. Verra's biochar protocol ([VM0044](#)) is not specific to the U.S. or Canada and lists nine projects (some are pending) with credits ranging from 1,000 to 117,000.

### **U.S. Soil Enrichment (CAR)**

This protocol is for projects that adopt sustainable agricultural practices to reduce emissions and sequester soil carbon. Practices that increase soil organic carbon and reduce GHG emissions can include organic fertilizer application (e.g., compost), soil amendments application, water management, irrigation, tillage/residue management, crop rotation/cover cropping, fossil fuel reductions, and grazing practices.

#### **Opportunities for Clients**

Clients with conventional agricultural practices might benefit from changes in their soil management strategy, such as incorporating compost or biochar products. For new or future clients in the agricultural sector, carbon credits through compost application to soil could help offset a portion of the costs for developing on-farm composting operations.

CAR's website lists five projects using a soil enrichment protocol. With such limited information, determining how many credits could be issued for a project is difficult. Running an example scenario using the protocol's quantification method to estimate credits for a hypothetical project would be advisable in these cases. Similarly, the Improved Agricultural Land Management (Verra) focuses on projects that adopt changes that improve fertilizer management, irrigation, reduced tillage, and improved grazing.

### **Reducing Food Loss and Food Waste (Verra)**

This protocol provides a quantification process for reducing GHG emissions by preventing food loss to landfills and by anaerobic digestion, composting, etc. Projects can address food recovery at several stages in the food supply chain, from field gleaning to retail, hospitality, and more. Eligible projects must divert food away from a list of destinations, including landfills, anaerobic digestion facilities, composting facilities, and wastewater treatment plants, among others.

#### **Opportunities for Clients**

Possible projects include edible food recovery. One important caveat to all protocols is "additionality." Projects are eligible for credits when the activity is a new GHG reduction that is not required or mandated at the government level.

Verra's public registry lists two projects. One project submitted in 2024 and located in the southeastern U.S. proposed a food recovery project for Publix grocery stores in 7 southeastern states. The estimated annual emission credits are 198,678. At a 2023 average price of \$6.97 per credit, the project could represent a market value of \$1,384,786.