



What Are Carbon Credits?

Carbon Markets 101

Prepared for COPA
April 2024





About Us:

The Carbon Containment Lab is a tax-exempt nonprofit working on novel and neglected climate solutions. Our work on **lifecycle refrigerant management** focuses on resolving system-wide bottlenecks that are holding back mitigation, including financing mechanisms such as the carbon market. We were founded at Yale University in 2020 and became an independent nonprofit in February 2024.



What's the Problem?

1. Polluters need to reduce emissions but can't eliminate all their emissions immediately or at low cost.



2. Polluters reduce some of their direct emissions, but also pay for emissions reductions elsewhere to “offset” their residual emissions.



Example: The polluter pays for a reforestation project and receives carbon credits in exchange.



Credits can also help fulfill other purposes:

- Financing for early stage activities and technologies that would otherwise have no market (i.e., carbon dioxide removal, methane mitigation from abandoned oil wells)
- Revenues supporting communities in which the projects occur and generate co-benefits (i.e., access to clean cookstoves, biodiversity protection)





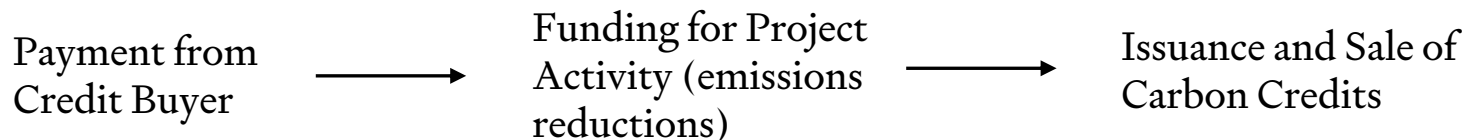
Overview to Carbon Markets

Vocabulary, market architecture, and
methodologies



What Exactly is a Carbon Credit?

A carbon credit (“offset”) is a tradeable certificate each representing 1 metric ton CO₂e avoided, reduced, or removed. Credits are not physical – instead, they can be bought and sold on online platforms for a price, like a stock.



Currently, the most common use of a carbon credit is as an “offset” for residual emissions – allowing companies to achieve regulatory compliance or claim “net zero” without eliminating their direct emissions.

Different Types of Carbon Credits

| Carbon Credits Come From a Wide Range of Activities | |
|---|---|
| Category | Description |
| Avoidance | <ul style="list-style-type: none"> • Credits fund a change in a behavior/actions that would have otherwise led to emissions • Examples: forest conservation (avoided deforestation), HFC reclamation |
| Reduction | <ul style="list-style-type: none"> • Credits reduce baseline emissions of a technology or process • Examples: Methane mitigation from landfills, coal mines, rice paddies, etc. |
| Removals | <ul style="list-style-type: none"> • Credits pay for the removal of CO₂ from the atmosphere • Examples: Reforestation, direct air capture, biomass carbon removal and storage |

Recently, carbon credits have received significant attention – and controversy.

Opinion • Carbon & Climate

Why it's more important than ever to invest in the voluntary carbon market

'Regulated carbon markets are worth a trillion dollars a year and cover 25% of global emissions — they are raising climate ambition worldwide'

Carbon Offset Market Faces Chaos as African Mega-Project Collapses

The breakup of the partnership behind one of the world's biggest carbon projects in Zimbabwe raises new doubts about the carbon market's ability to backstop failures.

Carbon credit speculators could lose billions as offsets deemed worthless

Many credits in the voluntary market going unused, with study finding some offsetting could make global heating worse

Cooking the books: cookstove offsets produce millions of fake emission cuts

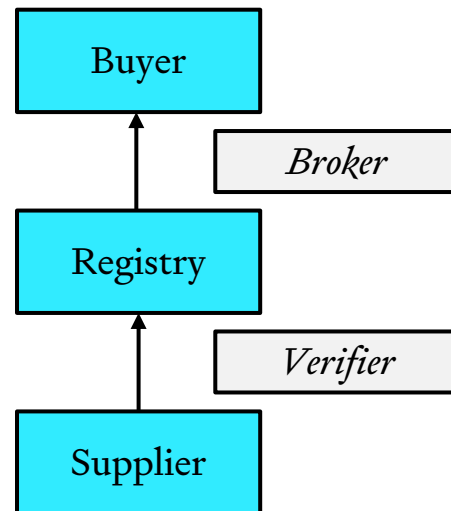
Yet, carbon markets are a critical tool in decarbonization:

The world is relying on carbon markets to function well and to scale to meet climate targets. Credits are widely acknowledged to be a critical tool for climate finance.

| Targeted Credit Volumes Across Market Categories (approx.) | | |
|---|-------------|------------|
| <i>Market/Year</i> | 2030 | 2050 |
| Voluntary Market | 2 billion | 13 billion |
| Carbon Removals | < 1 billion | 10 billion |
| Sources: McKinsey VCM , Scientific American Carbon Removals | | |

The Architecture of the Carbon Market

- Credits' underlying emissions are functionally invisible
- Commodifying credits requires sophisticated market infrastructure
- Interactions between Buyers and Suppliers ("project developers") are mediated by registries.
- Registries serve the important function of ensuring 1) the uniqueness of each credit, and 2) the quality of each credit.
- Registries set standards for emissions reductions and removals and approve Validation and Verification Bodies (VVBs) to police suppliers' projects.



Who are the registries?



Voluntary vs. Compliance Markets

Voluntary Market

- Composed of corporations, institutions, and governments – often who make “net zero” claims using credits
- By far the largest market in terms of credit volume and dollar value
- Registries include Verra, American Carbon Registry, and Gold Standard
- Functionally unregulated (participation is voluntary)

Compliance Market

- Composed of regulated emitters (often large industrial players)
- Emitters must reduce emissions, but can use a certain quantity of credits for compliance
- Government determines which projects are eligible
- Examples: European Union Emissions Trading Scheme, New Zealand Emissions Trading Scheme, California cap-and-trade

What Makes a Good Carbon Credit?

The underlying quality and integrity of carbon credits is the cornerstone of a well-functioning carbon market.

1. **Additional:** Would the emissions reductions occur in the absence of the carbon credit incentive?)
2. **Permanent:** Is there risk that the emissions reduction could be reversed?
3. **Measurable:** Is crediting accurate, conservative, and defensible?
4. **Transparent and traceable:** Are project activities well documented?

Unfortunately, credits on the market today often meet only a few of these criteria.

Guarding Against Perverse Incentives

Perverse incentives have previously plagued some carbon market projects.

- **Buyers and seller behavior:** Buyers want as many cheap credits as possible, whereas sellers want to make as much profit as possible. These desires can drive down credit quality in the absence of a regulated market.
- **Project-specific:** The value of selling a credit can result in undesirable behavior (ex. HFC-23 destruction)

Market architecture – including methodologies and registries – can reduce risk of perverse incentives

- Perverse incentives are a serious concern for markets, but aren't inherent to market mechanisms

The Role of Methodologies

- Registries establish standards for credit quality through documents called methodologies.
- Methodologies are the rulebooks that project developers must follow when seeking to generate credits (and that verifiers check developers against).
- Methodologies provide requirements for all aspects of the project, from quantification to underlying additionality.
- Methodologies are often developed by the suppliers/project developers who implement the projects.



Safeguarding Credit Quality

- Groups such as the Integrity Council for the Voluntary Carbon Market (ICVCM) are attempting to govern the global voluntary carbon market
- Most scrutiny has fallen on **avoidance and reduction** credits, particularly for additionality and quantification
- The voluntary carbon market is voluntary – meaning that credit quality tends to be a “race to the bottom” unless buyers have incentive to care

GOVERNANCE

1. Effective governance
2. Tracking
3. Transparency
4. Robust independent third-party validation and verification

EMISSIONS IMPACT

5. Additionality
6. Permanence
7. Robust quantification of emission reductions and removals
8. No double counting

SUSTAINABLE DEVELOPMENT

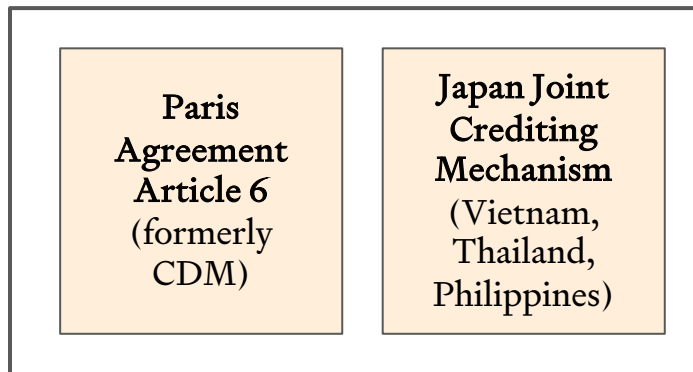
9. Sustainable development benefits and safeguards
10. Contribution to net zero transition

Today, there are **several available platforms** for carbon financing, including for lifecycle refrigerant management projects.

Corporate Buyers + Facilitators



Government Buyers + Facilitators





Quick Overview of Article 6 of the Paris Agreement

Market and non-market international climate finance





Thank you!

Any questions?

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carboncontainmentlab.org/projects/refrigerants





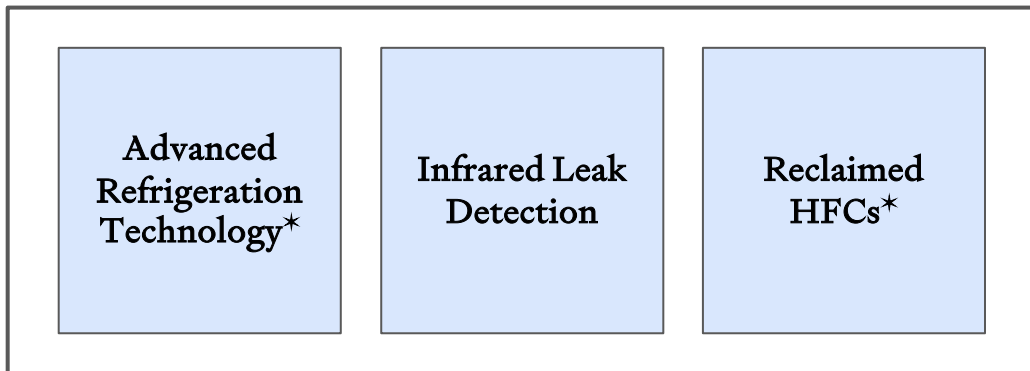
Extra Slides

Lifecycle Refrigerant Management and
Carbon Markets

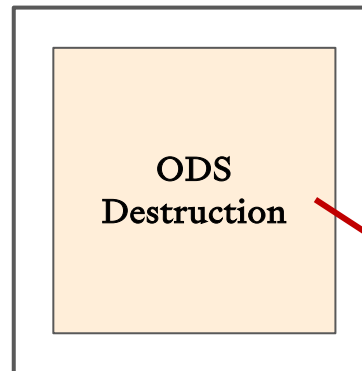


The market supports a wide range of LRM activities, but some activities have low coverage.

Operating Equipment



End-of-life Equipment

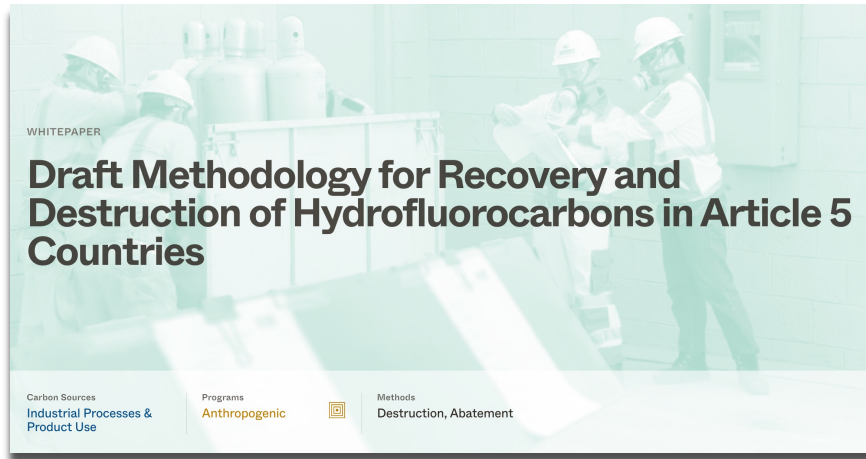


No large-scale eligibility for HFCs, except in New Zealand and Mexico.

*only in USA, Canada, and Mexico.

Read more: [CC Lab Fact Sheet on Fluorocarbon Methodologies](#), 2023.

Last May, we published a [Draft Methodology](#) for HFC Recovery and Disposal for Article 5 Countries, which is available for public comment.*



*expected version 2, May 2024

Notable Sections:

- White paper, Section III: Documenting recoveries to improve credit legitimacy
- White paper, Appendix III: Understanding effects of destruction on production and baseline consumption

Many of our peer reviewers and public commenters focused on risk of **perverse incentives** from HFC destruction.

- Selling virgin gas fraudulently labeled as “recovered” for destruction
- Destroying gases that would have otherwise been reused, creating excess production
- Increasing production to compensate for destruction
- Delaying progress on regulatory measures, such as extended producer responsibility



Our research suggests that **some of these risks are manageable.**

- Selling virgin gas fraudulently labeled as “recovered” for destruction – **stringent chain of custody requirements**
- Destroying gases that would have otherwise been reused, creating excess production – **ensuring baseline of venting**
- Increasing production to compensate for destruction – **Ozone Secretariat reporting data**
- Delaying progress on regulatory measures, such as EPR or product stewardship – **project viability contingent on transition to non-credit finance**



Looking ahead:



CDM Business

External project for greenhouse gas reduction

HFCs Refrigerant, an alternative of CFCs refrigerants, which were the main cause of ozone depletion, has a significant impact on global warming.

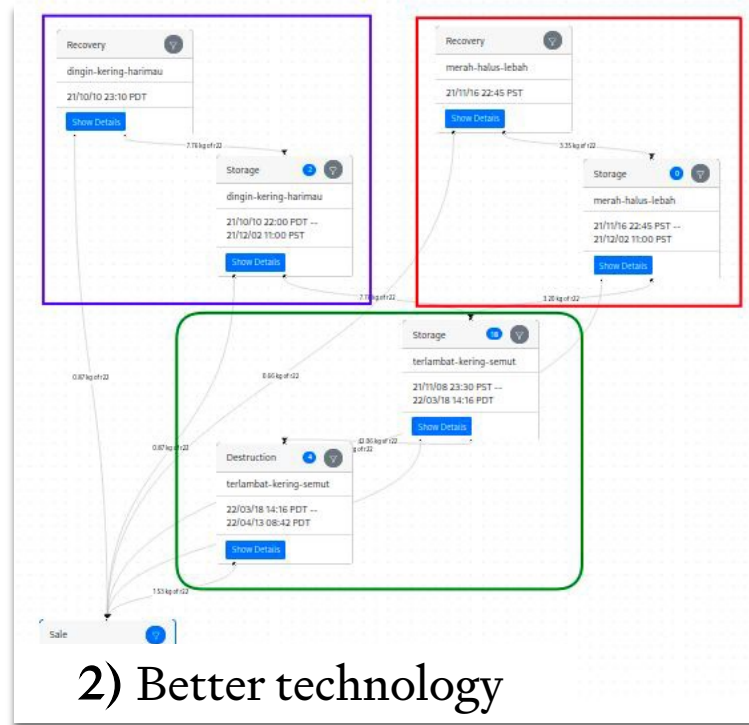
·Business sector | Recovering and reclaiming the HFC-134a waste refrigerants remained in a non-rechargeable cylinder.

·Annual average reduction of greenhouse gas emissions | 32,061 tCO₂-eq/yr

·Project Participants | OUNR2TECH Co., Ltd., Ecoeye Co., Ltd., Korea Southern Power Co., Ltd. SK Incheon Petrochem Co., Ltd.

·Business Methodology identification number | 13A-006-Ver01

1) More platforms



2) Better technology