Trove Research

Voluntary carbon market
2022 in review webinar

17 January 2022

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• The first section of the webinar will be a presentation by the Trove team, followed by Q&A

• All attendees are automatically muted

• Questions - click on the Q&A function at the bottom of your Zoom window – Aashni will then facilitate our Q&A at the end

• The slides, alongside a recording of this webinar, will be uploaded to www.trove-research.com later this week – please feel free to share it with your colleagues
Comprehensive data, analytics and research on corporate climate commitments and carbon credits

Policy landscape
• Guidance for corporates on setting carbon emission, Net Zero and Carbon Neutral targets
• Mapping of 160+ organisations influencing corporate climate commitments
• Consensus tracking, forward-looking opinion

Carbon credit projects & transactions
• Historic issuances by type, vintage, standard
• Performance metrics
• Compliance eligibility
• Issuance forecasts

Forecasting scenarios
• Short-, medium- and long-term voluntary carbon credit price scenarios
• Issuance forecasts
• Carbon credit demand forecasts
• Forecasts for reduction and removal credits

Corporate climate commitments & carbon credit demand
• Database of over 7,500 corporate climate commitments: SBTs, Net Zero, Carbon Neutral
• Historic & forecast emissions: Scope 1, 2, and 3
• Voluntary carbon credit demand forecasts

Carbon credit prices
• Weekly / monthly prices by transaction type
• Price tracking across indices, project types, vintage year, standard, and additional attributes
• Compliance markets price tracking

New Features in 2022
✓ New website launched
✓ >850 policy updates tracked
✓ 10+ detailed country profiles
✓ >7.5k corporate commitments tracked
✓ Most comprehensive corporate credit retirement database
✓ Enhanced supply analysis
✓ Project developer profiles
✓ AI-driven price calculator
✓ Pricing scenarios reports
✓ Team tripled in size
Agenda

1. Review of key policy and guidance themes
2. Review of corporate commitments
3. Review of carbon credit transactions
4. Review of carbon credit pricing
5. Market outlook for 2023
6. Q&A
Debate continued in 2022 on key policy & guidance topics: six key themes from 2022

**Tailwinds**

Corporate climate disclosures becoming mandatory

Frameworks for carbon credit use & scrutiny of corporate claims

Growing focus on biodiversity as part of climate fight

**Crosswinds**

Ongoing debate on carbon credit quality

More interest in jurisdictional standards, transactions & initiatives

Countries giving greater thought to NDCs and the interaction with carbon markets

View our VCMI webinar here

View our carbon credit quality webinar here
1. Pressure for companies to publish robust transition plans and prioritise immediate action

2. Overcoming methodological issues on a net zero standard for financial institutions (SBTi)

3. Greater guidance on carbon credit use, including ‘beyond value chain mitigation’ and defining quality (SBTi, VCMI, ICVCM)

4. Continued and growing interest in biodiversity/conservation

5. High-quality removals to come to the fore

6. Countries deliberating on how (if at all) credits help achieve NDCs
Number of corporates committing to act on climate continues to increase

4,253 companies have a SBTi approved target or have committed to setting one by end of 2024 – an increase of 2,369 on end of 2021

1,033 new companies committed to set an SBTi net zero target in 2022 – e.g.:

Source: Trove Intelligence database and SBTi

18 January 2023
Issuances dropped off in 2022

Annual issuances by project type (MtCO₂e)

Source: Trove Intelligence database
Registries tracked by Trove: Verra, Gold Standard, ACR, CAR, BioCarb, PuroEarth, Climate Forward, CDM, ART

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Issuances dropped off in 2022 – but jurisdictional (ART) REDD+ make up some of the shortfall

Annual issuances by project type (MtCO$_2$e)

- **Carbon Engineering**
- **Non-CO2 Gases**
- **Fuel Switch**
- **Energy Efficiency**
- **Renewable Energy**
- **REDD+**
- **Nature Restoration**
- **Jurisdictional REDD+**

Source: Trove Intelligence database

Registries tracked by Trove: Verra, Gold Standard, ACR, CAR, BioCarb, PuroEarth, Climate Forward, CDM, ART

18 January 2023  •  All J-REDD+ credits issued under ART-TREES

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Issuances bounced back in 4Q22

Quarterly issuances by project type (MtCO$_2$e)

Source: Trove Intelligence database
Registries tracked by Trove: Verra, Gold Standard, ACR, CAR, BioCarb, PuroEarth, Climate Forward, CDM, ART

-6% '21/22 incl. J-REDD+
-14% 21/22 excl J-REDD+

First J-REDD+ issuance: Guyana

* All J-REDD+ credits issued under ART-TREES
Retirements relatively steady year-on-year

Source: Trove Intelligence database

Registries tracked by Trove: Verra, Gold Standard, ACR, CAR, BioCarb, PuroEarth, Climate Forward, CDM, ART

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“Crypto” retirements disappeared in 2022

Quarterly retirements by purpose (MtCO₂e)

Source: Trove Intelligence database
Registries tracked by Trove: Verra, Gold Standard, ACR, CAR, BioCarb, PuroEarth, Climate Forward, CDM, ART

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Retirements by project type (MtCO₂e) – excluding crypto-related retirements

Source: Trove Intelligence database

Registries tracked by Trove: Verra, Gold Standard, ACR, CAR, BioCarb, PuroEarth, Climate Forward, CDM, ART

Retirements up on 2021 when exclude “crypto”

+11% '21/22 excl. crypto

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Retirements shifted towards more recent vintages in 2022

Quarterly retirements by vintage (%)

Source: Trove Intelligence database
Registries tracked by Trove: Verra, Gold Standard, ACR, CAR, BioCarb, PuroEarth, Climate Forward, CDM, ART

Total retirements (MtCO₂e)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
2012 2013 2014 2015-2013 ≤2012 Average Vintage

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Largest ten retirees in 2022

Credits retired by corporates in 2022 (MtCO₂e) *(based on disclosures to registries only)*

- **Delta**
  - Earliest vintage: 2000
  - Latest vintage: 2021

- **Eni**
  - Earliest vintage: 2017
  - Latest vintage: 2021

- **Shell**
  - Earliest vintage: 2008
  - Latest vintage: 2019

- Volkswagen
  - Earliest vintage: 2017
  - Latest vintage: 2021

- **easyJet**
  - Earliest vintage: 2012
  - Latest vintage: 2020

- **dpdgroup**
  - Earliest vintage: 2006
  - Latest vintage: 2021

- **Nespresso**
  - Earliest vintage: 2009
  - Latest vintage: 2021

- **Diamondback**
  - Earliest vintage: 2005
  - Latest vintage: 2005

- **Telstra**
  - Earliest vintage: 2019
  - Latest vintage: 2021

- **Tokyo Gas**
  - Earliest vintage: 2008
  - Latest vintage: 2019

Analysis covers retirement disclosures to Verra, Gold Standard, ACR and CAR registries; Source: Trove Intelligence database

18 January 2023

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Surplus continued to increase, albeit at reduced rate

Surplus by project type (MtCO$_2$e)

- **Carbon Engineering**
- **Non-CO2 Gases**
- **Fuel Switch**
- **Energy Efficiency**
- **Renewable Energy**
- **REDD+**
- **Nature Restoration**
- **Jurisdictional REDD+**

$+49\%$ (+193 Mt) ‘20/21

$+28\%$ (+162 Mt) ‘21/22

Source: Trove Intelligence database
Registries tracked by Trove: Verra, Gold Standard, ACR, CAR, BioCarb, PuroEarth, Climate Forward, CDM, ART

*All J-REDD+ credits issued under ART-TREES*
Largest ever increase in VCM pipeline

Pipeline capacity growth by quarter (MtCO$_2$e)

- Nature Restoration
- REDD+
- Renewable Energy
- Energy Efficiency
- Fuel Switch
- Non-CO2 Gases
- Carbon Engineering

Note: data shown on this chart covers Verra and Gold Standard registries only; Source: Trove Intelligence database

+160%
+302 Mt
’21/’22

Largest ever increase in VCM pipeline
Growing interest in high-tech, high-permanence removals – but little impact on emissions (yet…)

Scope of analysis includes Carbon Engineering projects which are likely to remove CO$_2$ with a permanence of >1000 years – including Biochar, Direct Air Capture and Enhanced Rock Weathering. It excludes Nature Restoration and existing Carbon Capture & Storage technologies; Sources: Trove Research analysis; press releases, Puro Earth, CDR.FYI, Raiffeisen Bank, and CB Insights

5x increase in purchases
MtCO$_2$e of high-permanence removals purchased or pre-purchased

But only 37 ktCO$_2$ removed in 2022
MtCO$_2$e confirmed as removed via high-permanence removals projects

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Overall weighted average market price up on 2021 – but down since start of Ukraine war

Monthly volume weighted average VER price - all projects (USD/t\text{CO}_2\text{e})*

2021 weighted average market price: $6.3
2022 weighted average market price: $8.8 (+40%)

VER = Voluntary Emission Reduction; * Averages are weighted by volumes of asks and transactions.
Source: Trove Intelligence database.
Prices and volumes of standardised contracts / tokens down

Weekly volume weighted average price (USD/tCO₂e)

Source: Trove Intelligence database
Nature-based projects continued to trade at a significant premium

Monthly volume weighted average VER price - by project type (USD/tCO$_2$e)*

VER = Voluntary Emission Reduction; *Averages are weighted by volumes of asks and transactions. Trove Intelligence subscribers can access more granular weekly average prices via our platform / weekly report

Source: Trove Intelligence database
Primary voluntary carbon market size ($m)

The market could grow up to 40% in 2023

Source: Trove Intelligence

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Quick audience poll

What will carbon credit prices be at year-end?
Did prices end 2022 where we all expected?

Expected average price by poll respondents and actual Q4 price - by project types (USD/tCO\textsubscript{2e})*

**Renewable/Energy Efficiency**
- Renewable Energy: $4.7/t
- Energy Efficiency: $6.2/t

**REDD+**
- Actual Q4 price: $10.7/t

**Nature Restoration**
- Actual Q4 price: $9.4/t

*Charts show distribution of votes from the past three Trove quarterly update webinars to the question "Where do you think carbon credit prices will end 2022?"*
Poll Results – 2022 In Review Webinar

Expected average price of credits by poll respondents - by project types (USD/tCO$_2$e)

Charts show distribution of votes in percentage terms from the poll conducted during this webinar by Trove Research.
Questions?

Please type your questions using the Q&A button at the bottom of your Zoom window.

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We’d love to have your feedback – please fill in the survey that will follow this webinar.

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## Appendix – Trove Research’s Carbon Industry Classification (TR CIC)

Read more about the classification at [https://trove-research.com/commentary/tcic/](https://trove-research.com/commentary/tcic/)

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Project Type - Description</th>
<th>Project Subtype (Level 2)</th>
<th>Project Subtype (Level 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nature Restoration</strong></td>
<td>Approaches that increase greenhouse gas sequestration into the biosphere by restoring living biomass and soils towards their pre-disturbance state. Includes most emissions “removals” alongside Carbon Engineering.</td>
<td>N.1. Aforestation/afforestation/revegetation (ARR)</td>
<td>N.1.1. ARR – No Timber Harvesting, N.1.2. ARR - Timber Harvesting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N.2. Agricultural Land Management (ALM)</td>
<td>N.2.1. Agroforestry, N.2.2. ALM-Other, N.2.3. Soil Carbon, N.2.4. Sustainable Grassland Mgmt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N.3. Avoided Conversion of Grasslands and Shrublands (ACGS)</td>
<td>N.3.1. Avoided Conversion of Grasslands and Shrublands (ACGS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N.5. Improved Forest Management (IFM)</td>
<td>N.5.1. IFM - Mixed Removal/Reduction, N.5.2. IFM-Reduction Only, N.5.3. IFM-Removal Only</td>
</tr>
<tr>
<td><strong>REDD+</strong></td>
<td>Reduction of carbon dioxide emissions through the avoidance of deforestation, either planned or unplanned. Program initially implemented by the UNFCCC.</td>
<td>D.1. General Deforestation</td>
<td>D.1.1. General Deforestation</td>
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<tr>
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<td></td>
<td>D.2. Planned Deforestation (APD)</td>
<td>D.2.1. Planned Deforestation (APD)</td>
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<tr>
<td></td>
<td></td>
<td>D.3. Unplanned Deforestation (AUDD)</td>
<td>D.3.1. Unplanned Deforestation (AUDD)</td>
</tr>
<tr>
<td><strong>Carbon Engineering</strong></td>
<td>The removal and storage of carbon dioxide emissions from the atmosphere and into materials that don’t create or increase biomass carbon stocks. This often necessitates industrial assets.</td>
<td>C.1. Biochar</td>
<td>C.1.1. Farm-scale Biochar, C.1.2. Large-Scale Biochar</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C.5. Direct Air Capture (DAC)</td>
<td>C.5.1. Direct Air Capture (DAC) for Products, C.5.2. Direct Air Capture (DAC) for Storage</td>
</tr>
<tr>
<td><strong>Non-CO₂ Gases</strong></td>
<td>All techniques that primarily reduce greenhouse gas emissions other than carbon dioxide (e.g., landfills, waste treatment systems, fugitive emissions…).</td>
<td>G.1. Chemical</td>
<td>G.1.1. Chemical (N₂O), G.1.2. Chemical (SF₆)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>G.2. Fugitive Emissions (CH₄)</td>
<td>G.2.1. Fugitive – Other, G.2.2. Mining, G.2.3. Oil &amp; Gas Production, G.2.4. Power Generation</td>
</tr>
<tr>
<td></td>
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<td>G.3. Landfill Gas (CH₄)</td>
<td>G.3.1. Landfill Gas (CH₄)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>G.4. Ozone Depleting Substances (CFCs, HCFCs, &amp; PFCs)</td>
<td>G.4.1. CFCs, G.4.2. HCFCs, G.4.3. PFCs</td>
</tr>
<tr>
<td><strong>Energy Efficiency</strong></td>
<td>The reduction of CO₂ emissions by decreasing the energy needed by equipment (either domestic or industrial), energy systems, and single power generation units.</td>
<td>E.1. Clean Cooking</td>
<td>E.1.1. Clean Cooking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E.2. Energy Demand Reduction</td>
<td>E.2.1. Domestic Demand, E.2.2. Industrial and Commercial Demand</td>
</tr>
<tr>
<td><strong>Fuel Switch</strong></td>
<td>Change of energy source within an energy system or its individual beneficiaries (such as power plants &amp; vehicles) without adding or removing any installed capacity.</td>
<td>F.1. Biofuel</td>
<td>F.1.1. Biogas-to-Fuel, F.1.2. Liquid Biofuel, F.1.3. Solid Biomass,</td>
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<td></td>
<td></td>
<td>F.2. Hydrogen and Hybrid</td>
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<td>R.2. Hydro</td>
<td>R.2.1. Small-scale Hydro, R.2.2. Large-scale Hydro</td>
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