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2022 VCM Forecast and Retirement Analysis

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Who We Are

AlliedOffsets is a London-based data and technology firm focused on providing transparency for the voluntary carbon market (VCM).

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Key Data Points Analyzed

- Aggregated unique data points from leading carbon offset registries and over 150 carbon resellers and brokers
- 11 registries
- 20,000+ voluntary carbon offset projects from 150+ countries
- Detailed OTC pricing information
- Credit-level data on offset buyers
- Data on validators and auditors of projects
- Data on 450+ emerging CDR projects
- Data from project design documents and other project documentation

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Purpose of Report

The purpose of this report is to showcase the state of the VCM: supply and demand drivers, retirement forecast for 2022, upcoming issuances, and pricing trends for current projects as well as carbon dioxide removal (CDR) projects that are quickly growing in scale and number.

The data in the report has been compiled or generated by AlliedOffsets. For more information, please visit our website. To try out demo, click here.

The report will be updated on a regular basis, to help provide actionable insights into VCM activity for market participants. If you have any questions, please contact hello@alliedoffsets.com.

The report was prepared by Anton Root, Head of Research, and Antonia Drummond, Carbon Market Data Analyst.

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Overall Retirement Activity and Forecast

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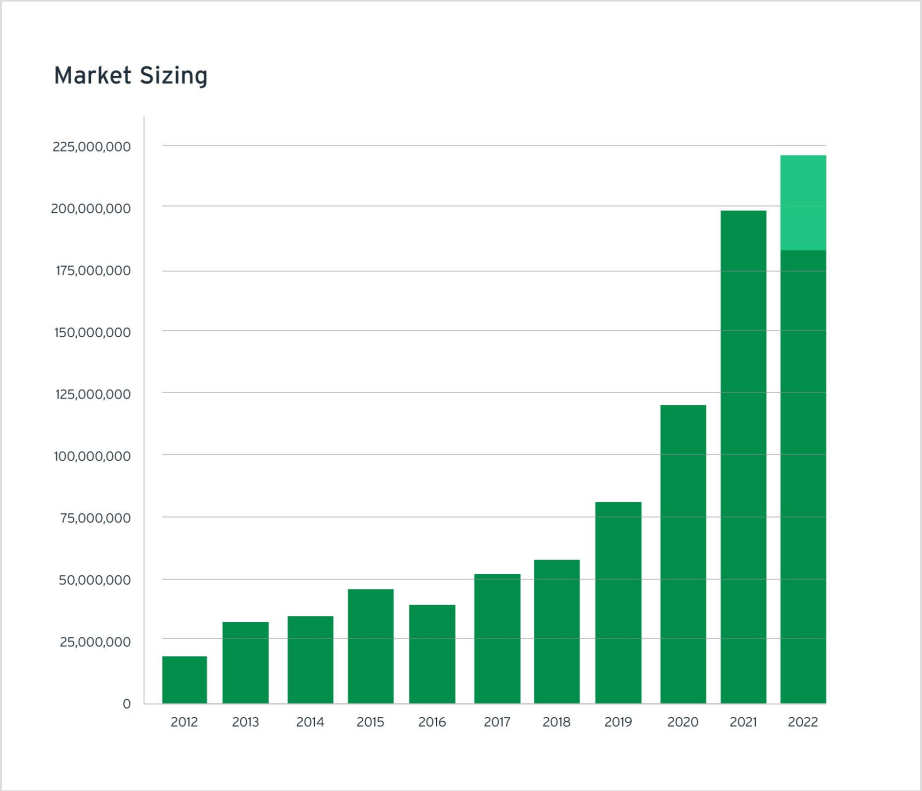

- Retirements **forecast to reach 201m** (up from 196m)
- Market growth slowing considerably vs. ‘20-’21
- Current number of credits retired: ~130m
- Anticipated 2% growth in credits retired in ‘22 vs. ‘21 (95% CI: -6% to 11%), compared to 73% growth between ‘20 and ‘21

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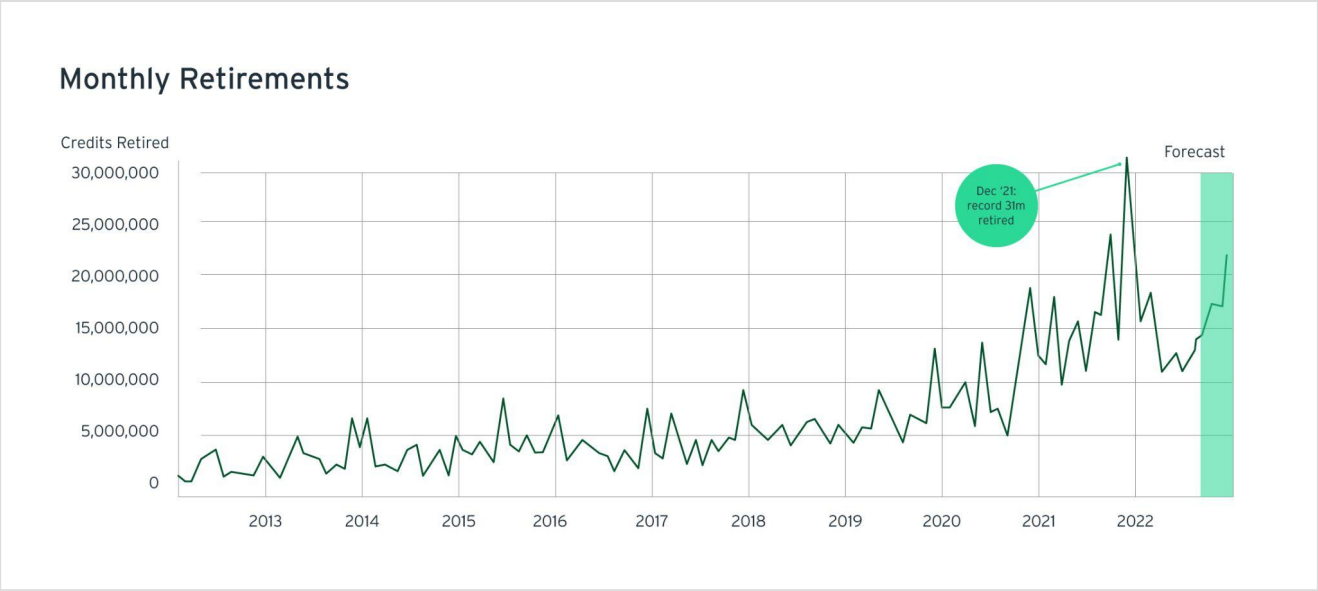

- Facebook Prophet Model chosen due to its ability to model seasonal effects with additional regressors, its ability to handle outliers, and its performance on a test-train split of the data
- The model predicts a continued growth of the VCM that is more subdued than the Q4 ‘21 and Q1 ‘22 jumps in retirements suggest
- Model showed seasonal effects for December, is associated with an average 400k bump in retirements

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Potential Reasons for Slowdown

- There are a number of reasons for the decrease in growth we anticipate. One consideration is the lack of tokenized credit retirements, which made up ~20m tCO2e in Q4 ‘21 and Q1 ‘22. Without these, the total retirements last year would have been at around 180m tCO2e (instead of 196m), and we would be forecasting a final retirement figure closer to 190m tCO2e. If standards setting bodies allow tokenization activity on their registries before the year’s end, we may see a large number of retirements taking place, pushing up the numbers significantly.

- The slowdown is also likely to be caused by political (Ukraine invasion) and economic (inflation, recession fears) shocks. As uncertainty clouds around companies, most are unlikely to increase their budgets on sustainability initiatives; slowing demand is also seen in pricing data, with prices on a downward roll since April. Whether companies have truly slashed their carbon offset budgets will likely be better seen next year, as money they spent this year may have been allocated for this purpose in 2021.

- With uncertainty in the market, 2021 will be remembered as the year the VCM got the hype, 2022 will be the year where we see whether the market has gone mainstream.

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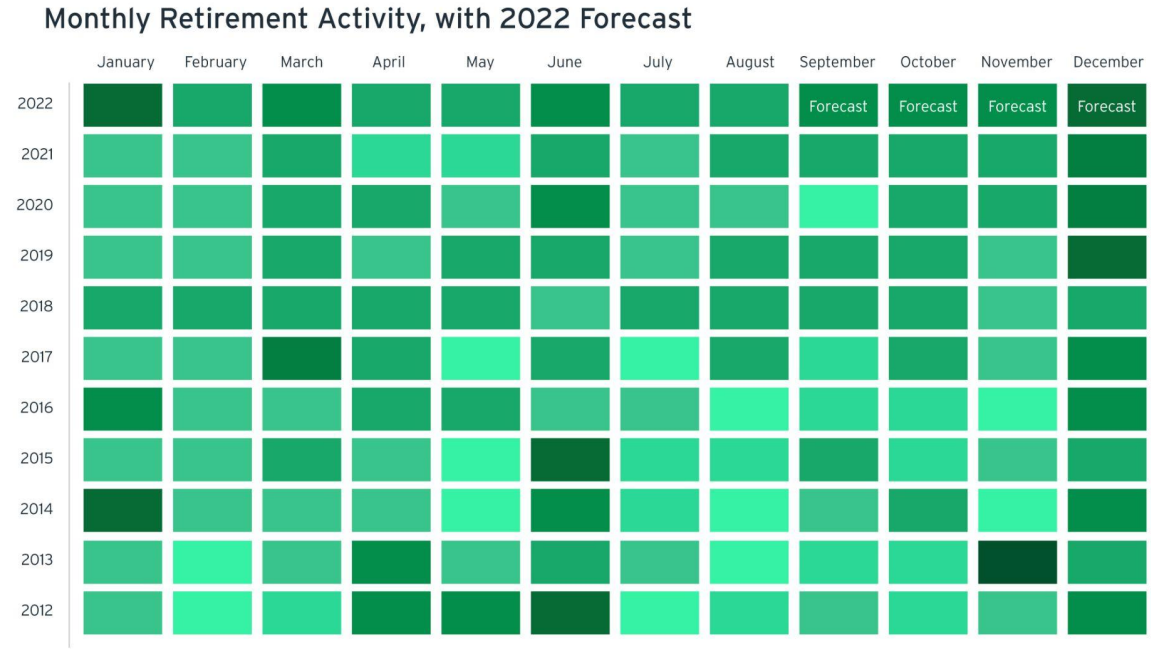

- Most activity typically comes in January, June, and December
- Forecasting 22m tCO2e to be retired in December 2022

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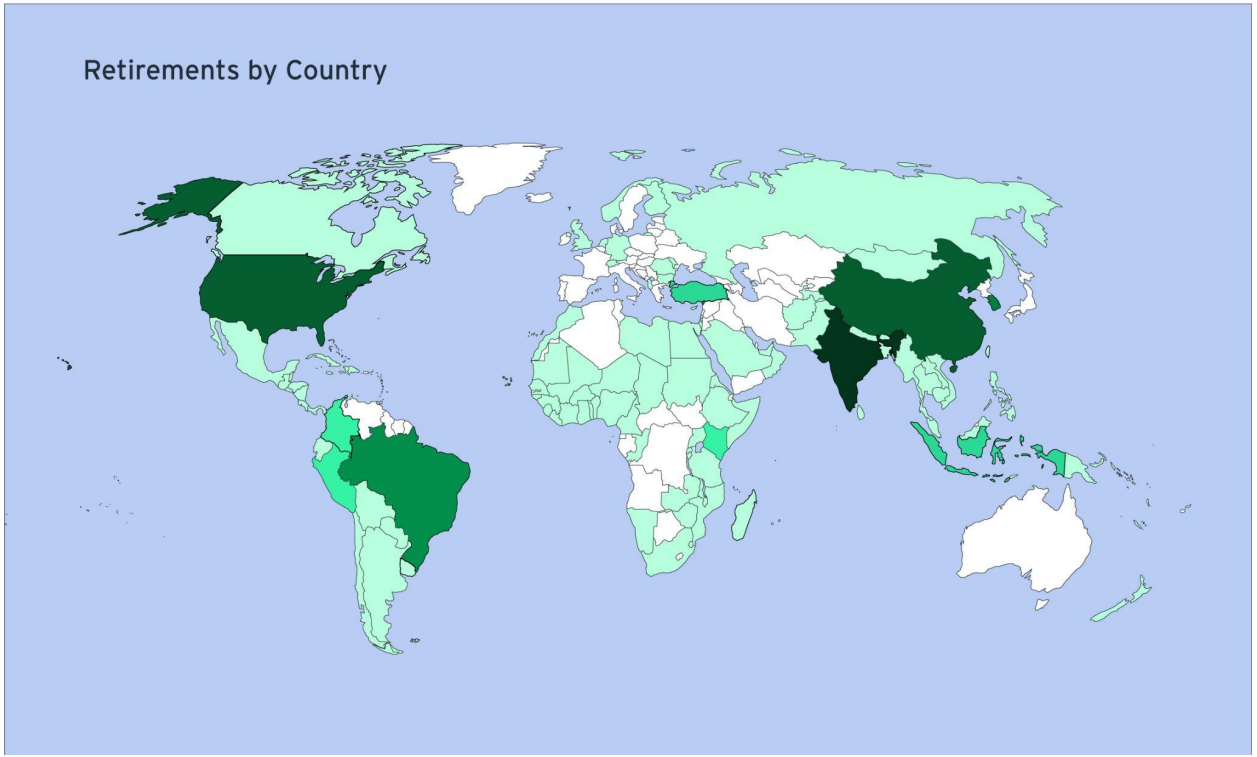

- The country with the most retired credits, India, has had nearly 7 times the number of retired credits as the country with the 10th highest retired credits, Kenya
- Of the top 10 countries by credits retired, four are in Asia and only one is in Africa

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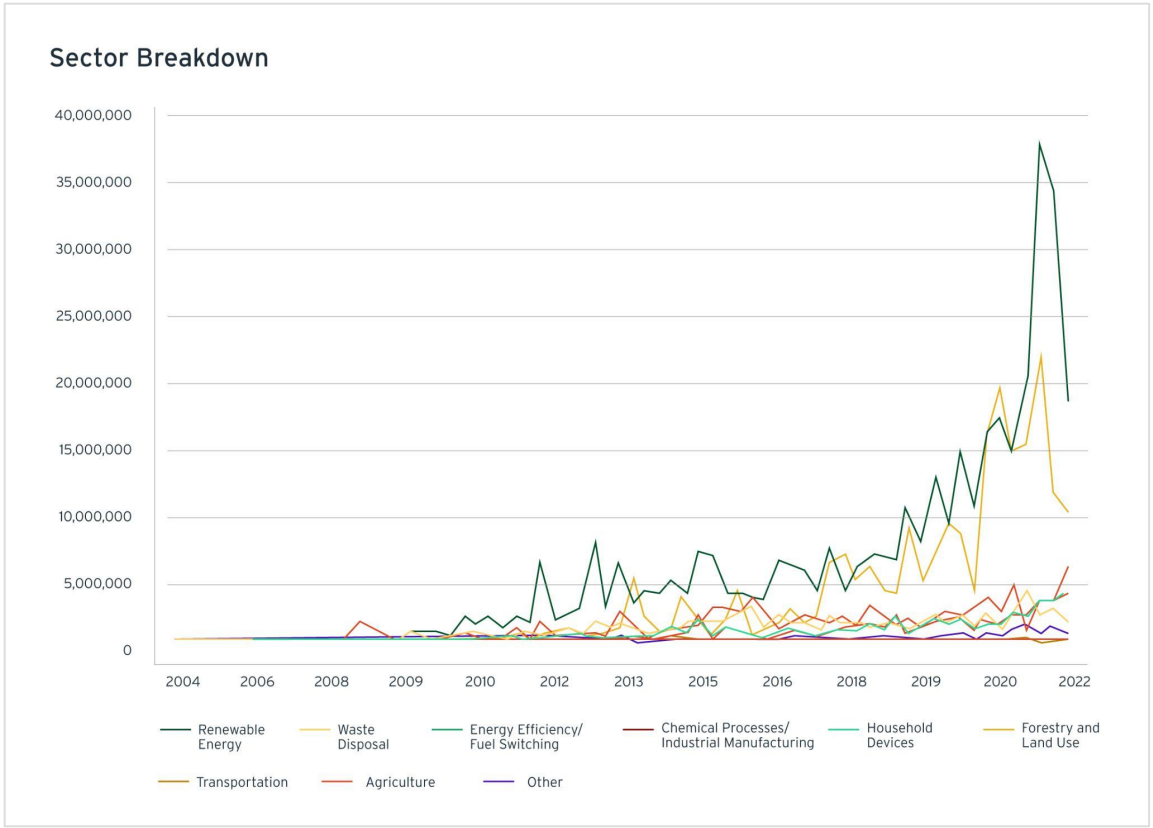

- Decrease in retirements of Renewable Energy (RE) and Forestry credits leading to slower growth in overall market
- RE and Forestry make up ~80% of all credit retirements in 2020 and 2021
- Likely driven by weakened demand due to lower business sentiment, slowdown in crypto activity, Ukraine invasion, recession fears

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Demand Analysis

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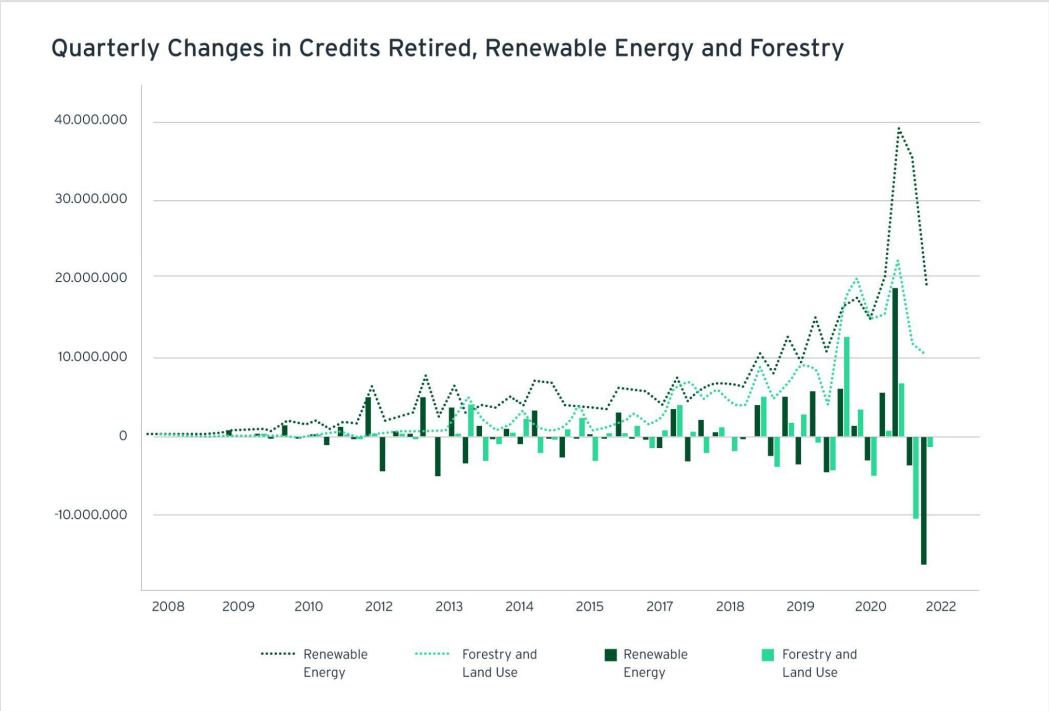

- Until Q1 ‘22, the overall trajectory for forestry and renewable energy retirements was upward; in Q1 ‘22 Forestry retirements were half of that in Q4 ‘21
- Further drop in Q2 ‘22: first time both Forestry and RE experienced negative growth simultaneously two quarters in a row (the definition of a recession in financial markets)

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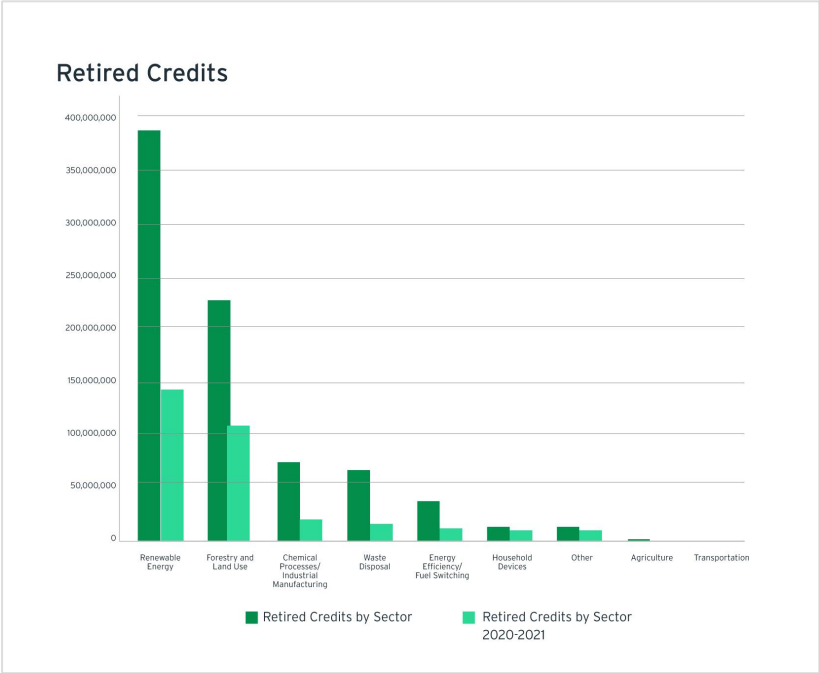

- Nearly half of all credits retired to date have been for RE projects
- In 2020 and 2021, retirements for Forestry projects have grown markedly vs. RE; this is driven by larger retirements across a smaller number of projects than RE

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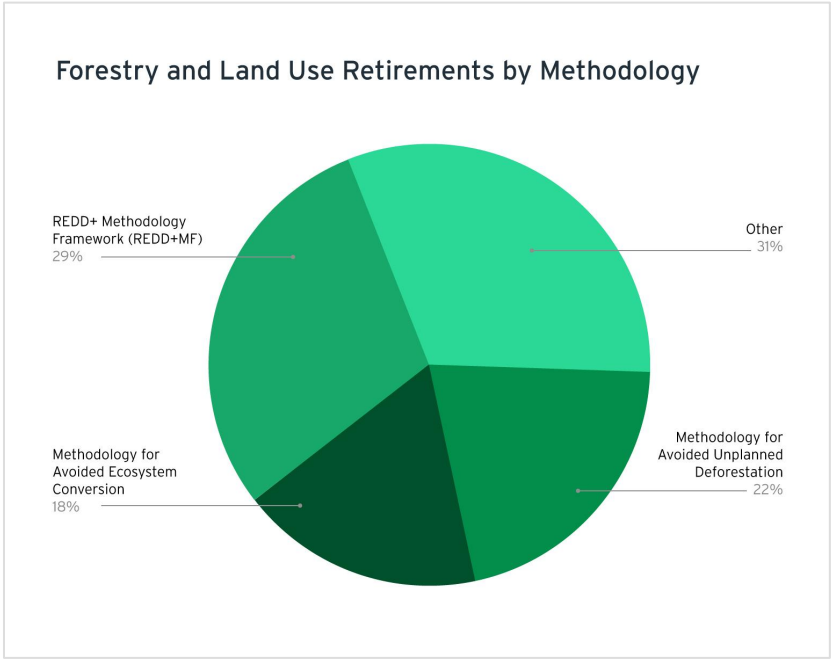

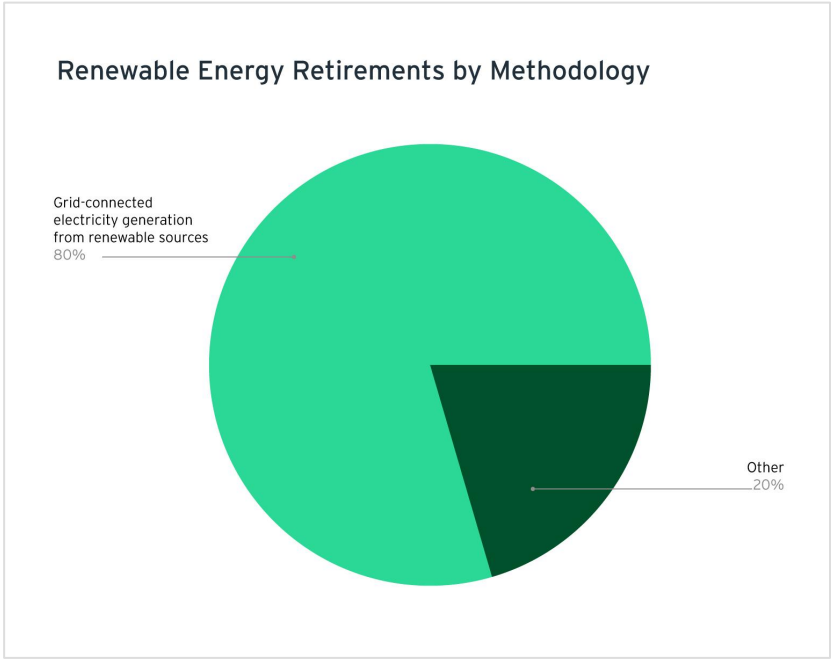

- ACM2 (grid-connected renewable energy) projects make up 80% of all RE credits retired to date
- Forestry credits are more diverse, with REDD+, Avoided Conversion, and Avoided Unplanned Deforestation taking up roughly equal shares of the market

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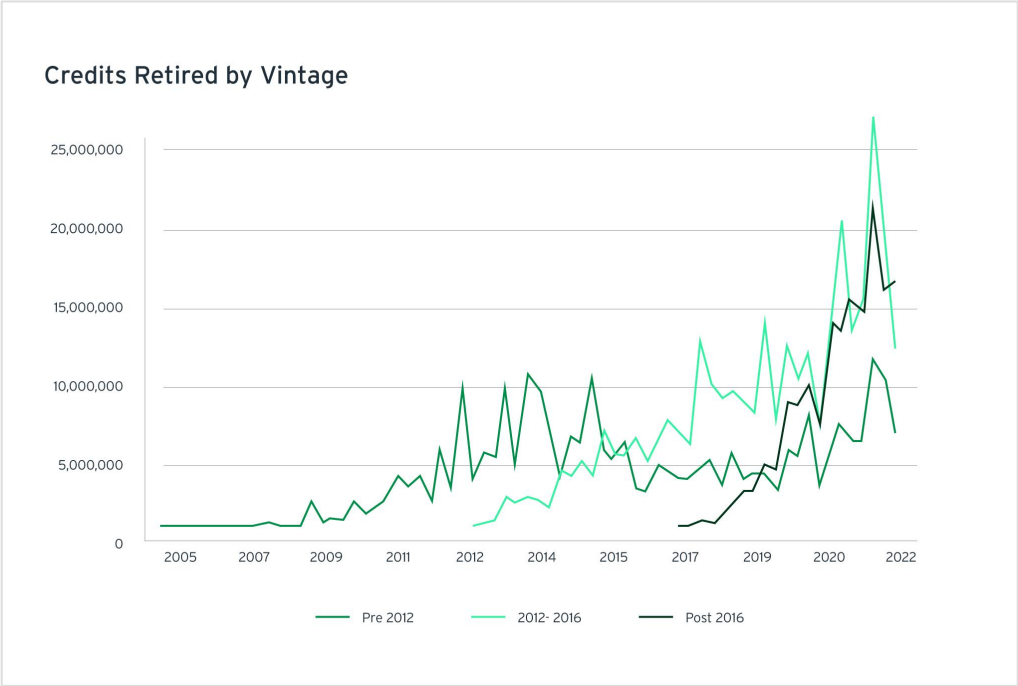

- Post-2016 credits were only ones of the three categories to grow in number of retirements between Q1 and Q2 ‘22, with potential demand coming from CORSIA-compliant firms
- Pre-2012 credits still make up fairly large percentage of the market, with nearly 20% of retirements in 2021-22 coming from vintages 10+ years old

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Supply Analysis

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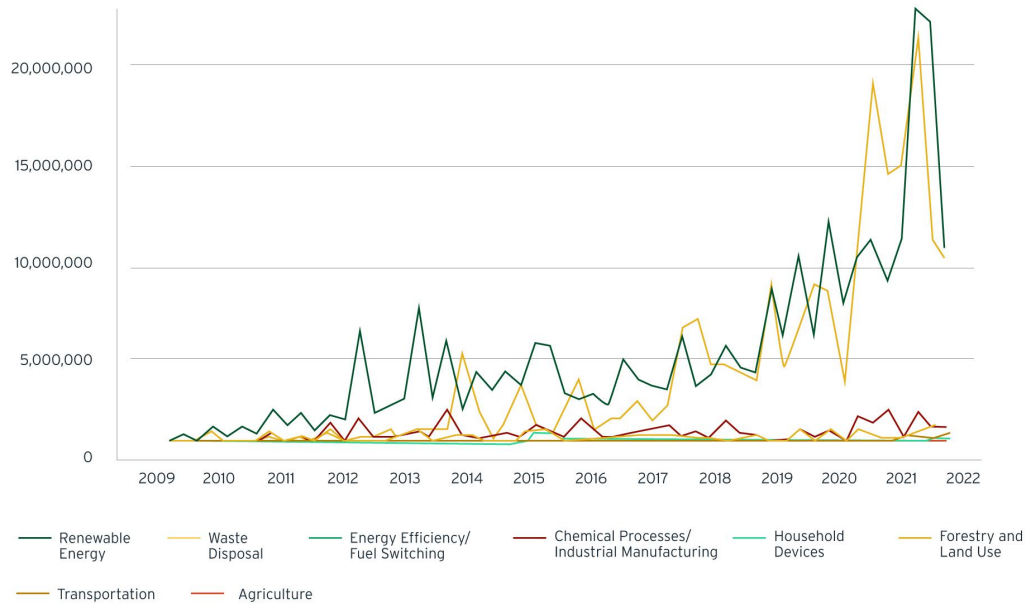

- The decline in retirements has a corresponding decline in issuances, particularly in Forestry and RE projects, in Q2 ‘22
- This could be due to the market stabilizing following a surge of issuances immediately post-COVID
- Q2 was still 7th-largest quarter of credit issuances on record (since Q1 09)

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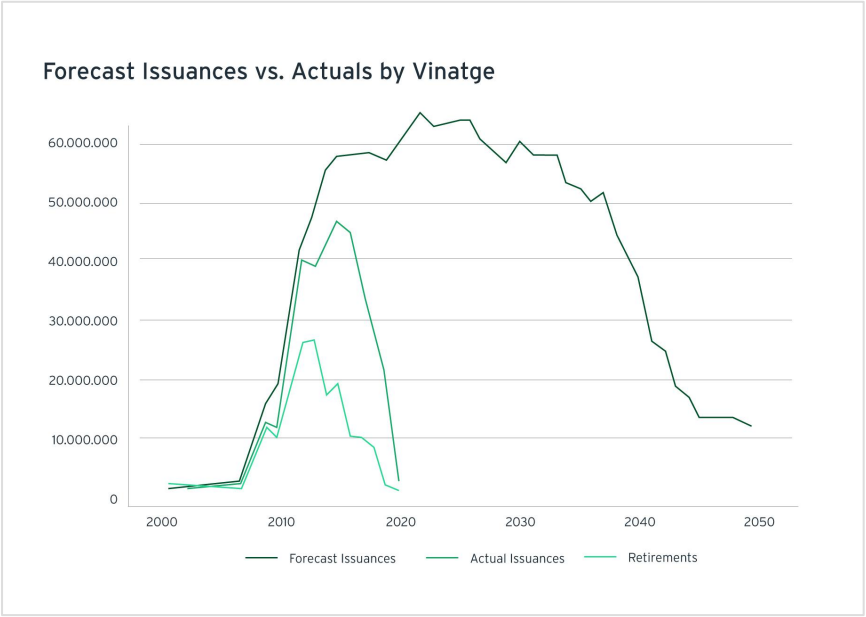

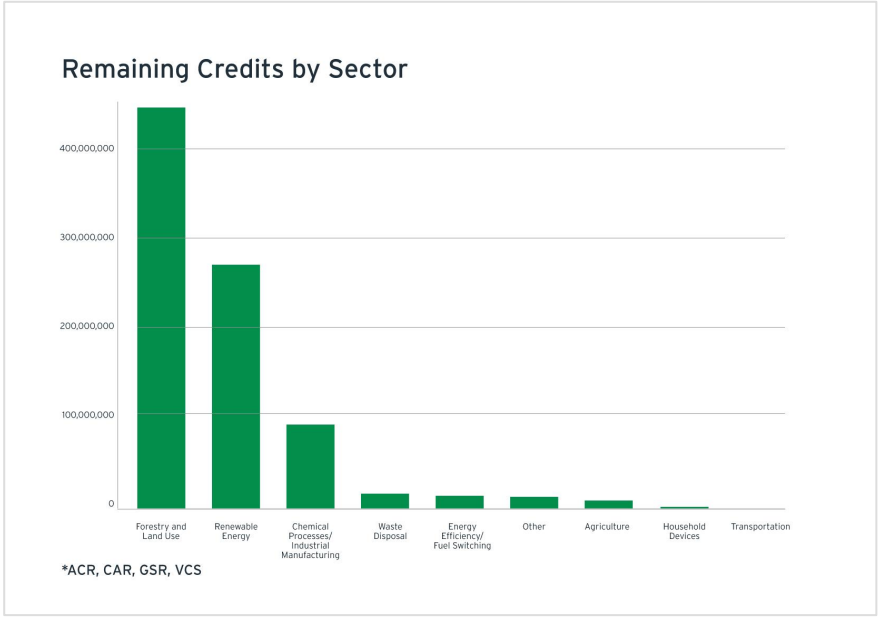

- Chart on the left shows the credit issuances projected by the top 50 Verra Forestry projects, in their PDDs
- Future issuances for top 50 Forestry projects to plateau / begin decrease after 5 years; however, there is a supply of over 450m tCO2e of existing Forestry credits in the market
- 2020 and 2021 combined saw 109m Forestry credits retired – demand needs to ramp up quickly to buy existing credits

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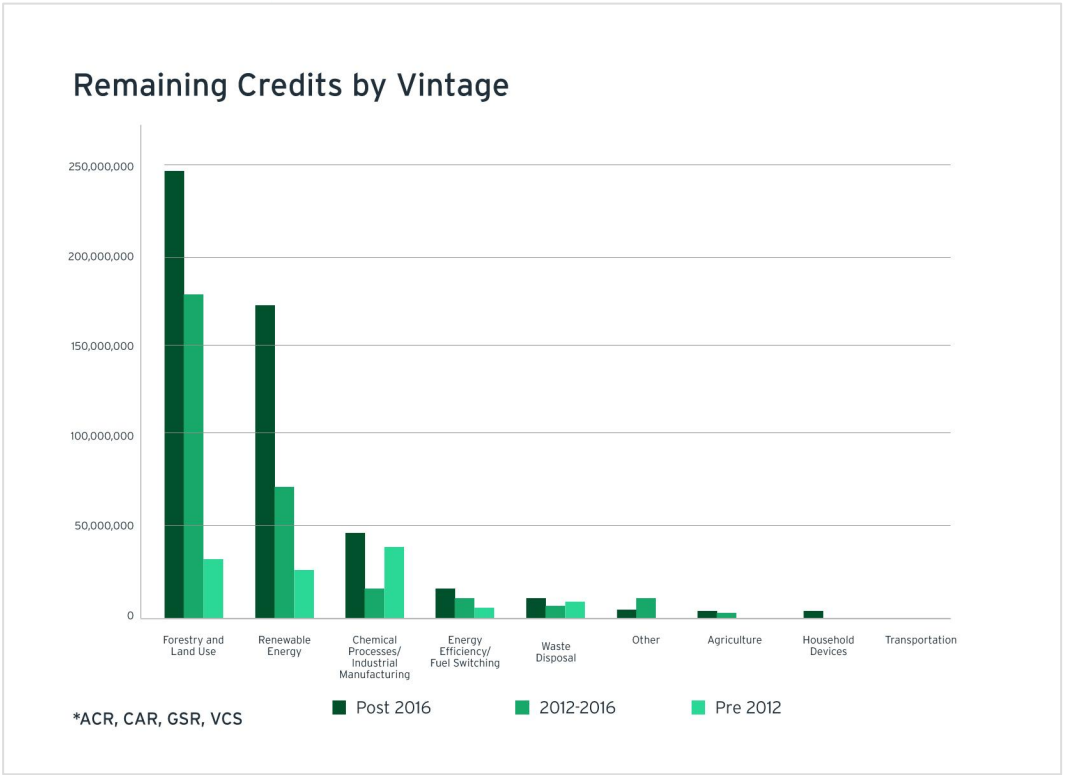

- Remaining credits are credits that have been issued but not yet retired
- Overall, the largest group of non-retired credits have more recent (post-2016) vintages, and there are the least amount of remaining credits from early (pre-2012) vintages
- Chemical / Industrial projects have relatively high supply of early vintages

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Buyer and Transaction Analysis

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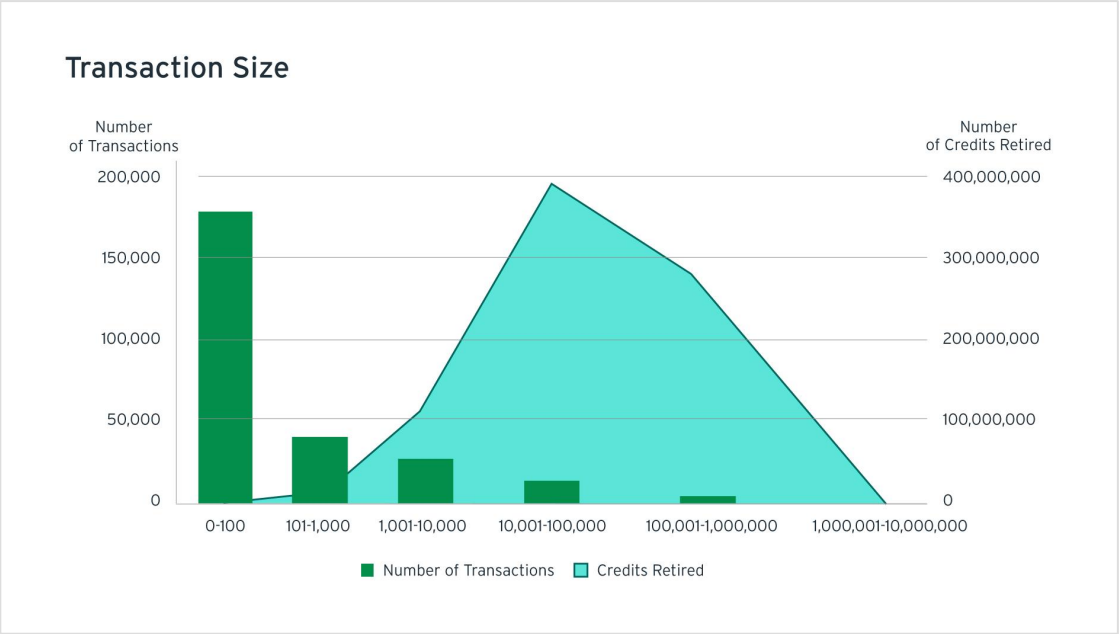
- VCM is dominated by big transactions: ~70% of retirements are for fewer than 100 credits (via online retail-focused marketplaces), but retirements over 100 credits account for 99% of the market

Registry	Avg. Retired Credits
VCS	3,031
PUR	219
NOR	25
GSR	1,211
CDM	28,401
CAR	5,908
ACR	4,318
ACORN	5,571



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Company-Retirement Matching

AlliedOffsets has matched data on hundreds of millions of retirements to end buyers (companies retiring the credits). Overall, we have matched:

25%

of all retirements

33%

of all retirements in the last 3 years

To put this into context, 40% of transactions are completely anonymous, meaning we have matched over 50% of all named credits ever retired to a company or broker making a claim on the retirement.

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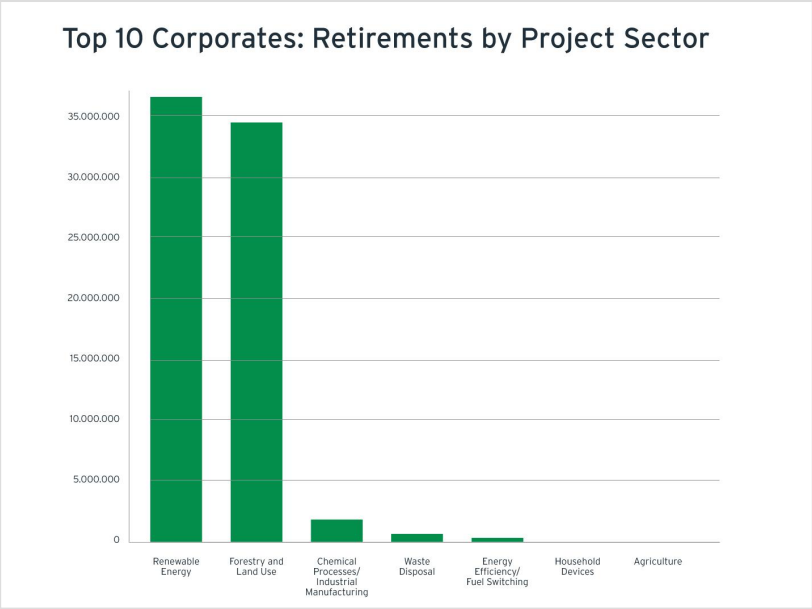
- 90% of all retirements in the last 3 years by the top 10 companies have been for RE and Forestry projects
- 59% of retirements have been for projects in Asia, primarily in China, India and Indonesia. A further 22% were for projects in South America and 17% for projects in Africa



Main Account	Retirments last 3 years
Toucan Token	22119807
Delta	20213480
Shell	9421373
easyJet	5857454
Telstra	5563131
Banco Votorantim	4993267
Eni	4940213
Volkswagen	4924398
Takeda	4803621
Gucci	4735023

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Pricing Analysis

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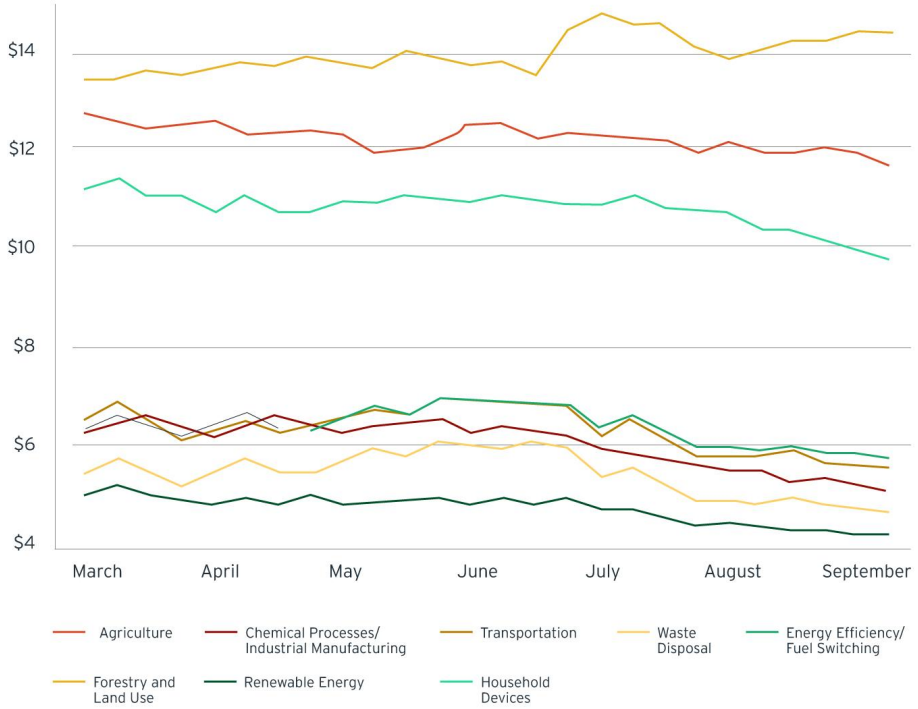
- Forestry and Household Device projects trade, on average, at twice the price of other sectors
- Mean prices for all sectors but Forestry declined since start of the year
- Wholesale price estimates model VCM activity on OTC, broker-led markets



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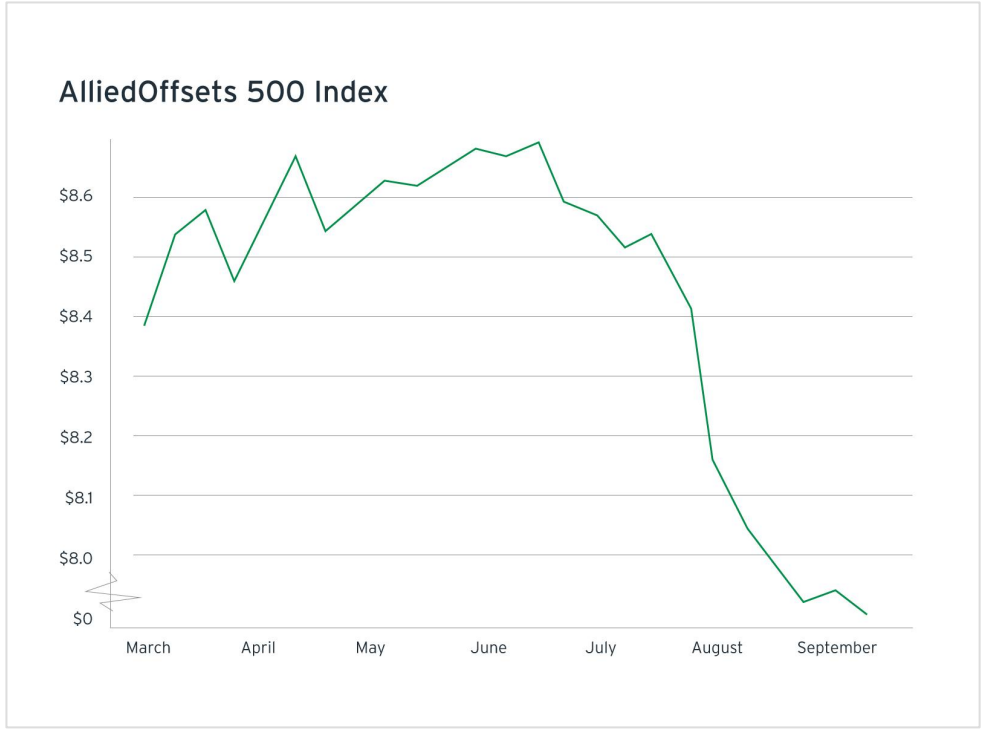
- The AlliedOffsets 500 Price Index dropped ~$0.50 between July and September 2022
- Index tracks the weighted average price for the top 500 projects by number of retirements in the last 3 years



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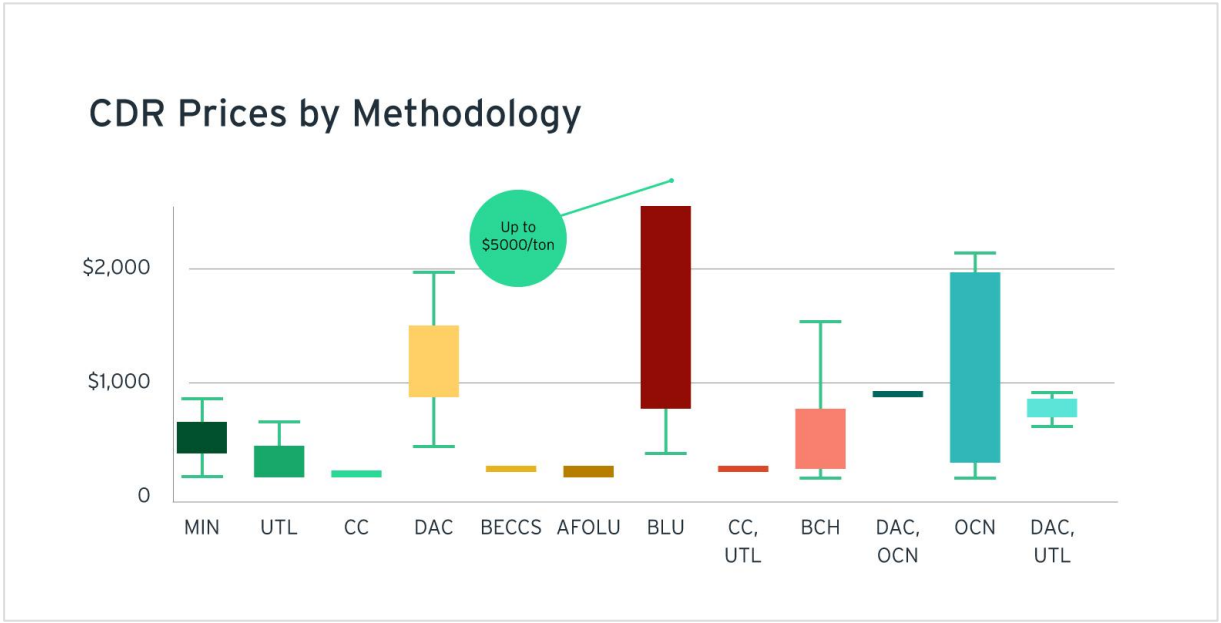

- AlliedOffsets also models data on pricing of carbon dioxide removal (CDR) projects, which represent the future of the carbon market
- CDR projects tend to be priced above $100/ton that's seen as threshold for widespread adoption
- Prices vary widely across DAC, blue carbon, and ocean alkalinization projects; BECCS and carbon capture experience more stable prices, likely due to relatively more mature technologies

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CDR Definitions

Acronym	Name	Description
DAC	Direct Air Capture	Pulling CO2 out of the atmosphere, not point of source technology.
CC	Carbon Capture	Capturing CO2 at point of source.
BCH	Biochar	Turning biomass into charcoal.
MIN	Weathering and Mineralization	Storing CO2 as a solid form in minerals.
UTL	Utilization	Turning captured CO2 into products.
BECCS	Bioenergy with Carbon Capture and Storage	Burning renewable biomass to create energy, capturing the CO2 emissions, and storing the CO2.
OCN	Ocean Alkalinization	Adding alkaline substances to seawater in order to enhance the effectiveness of a sea's CO2 capture properties.
BLU	Blue Carbon	Restoring and promoting new growth of peatlands, mangroves, tidal marshes, seagrasses, kelp, etc.
AFOLU	Agriculture, Forestry, and Other Land Use	Turning to forests and agricultural fields in order to sequester CO2 out of the atmosphere more efficiently; also includes projects and companies that improve trees' effectiveness in absorbing carbon.

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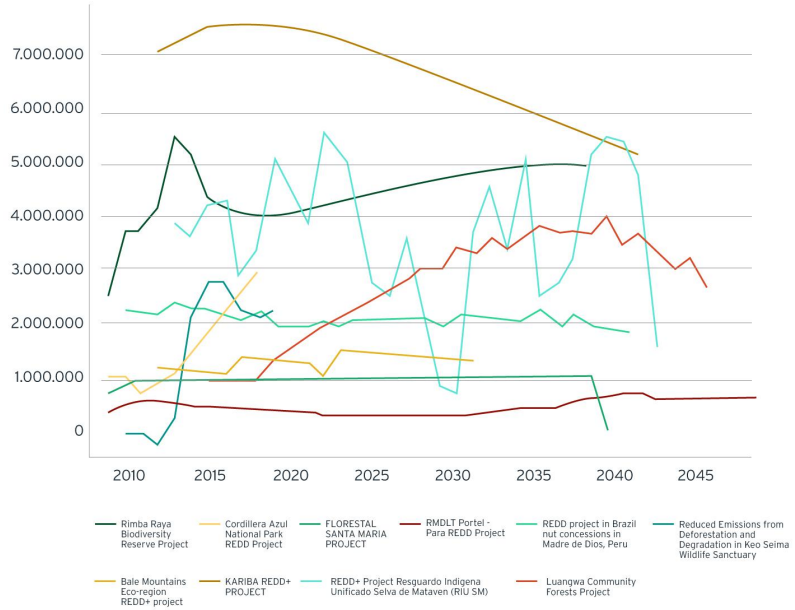

- This shows the projected issuances for top 10 Verra forestry projects (by credits retired to date)
- Some projects have steady stream of credits to be issued, others are much more variable year to year
- Registry data shows only estimated annual number, which may be highly misleading
- This analysis can help companies understand what specific projects (as well regions or sectors) will be issuing in the coming years
- Data extracted automatically from PDDs of projects

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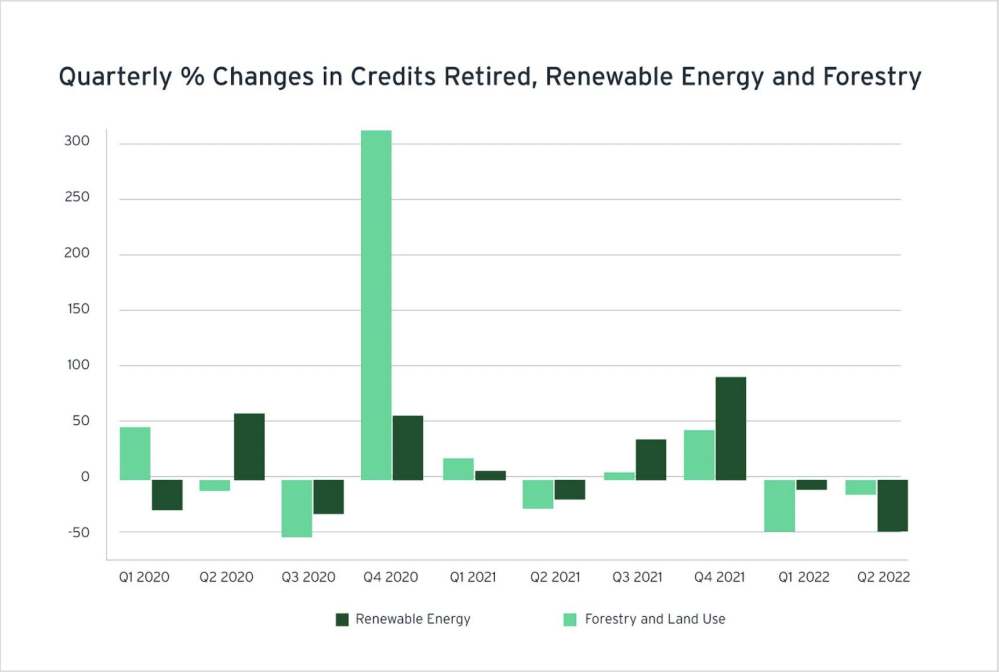

- This shows the quarterly growth in retirements for the two biggest sectors in the market: Renewable Energy and Forestry
- Forestry saw a massive jump in retirements at the end of 2020, growing to more than three times the credits retired the previous quarter
- Q1 and Q2 ‘22 have seen both sectors’ retirements shrink at the same time in two consecutive quarters for the first time in the market’s history