AlliedOffsets

Forecasting the Voluntary Carbon Market

Projecting VCM growth to 2040

Introduction from Our Co-Founder

"The voluntary carbon market (VCM) is at a point of inflection. Headwinds in the market – an unfriendly political climate in key countries, tightening budgets for sustainability, and an oversupply of historic credits – could batter already low sentiment. But there are also glimpses of a rebound: improved credit quality means trust is slowly coming back to the market, consolidation among actors means increased efficiencies, and an Article 6 boost could very well mean the VCM is primed for a big year.

In order to help the market make sense of these competing scenarios, AlliedOffsets is thrilled to launch our Forecast Model. The model is the culmination of five years of industry-leading data collection and analysis, crunching millions of historic data points in order to project where the market is heading.

A model is only as good as its underlying assumptions and inputs – **and we are confident that ours presents the most sophisticated approach to prognosticating the market.** On the supply side, the model takes inputs on (currently) 14 sectors and almost 200 countries and territories, across nearly 50 assumptions. This means there are nearly 150,000 individual inputs that impact the issuance of credits in any given year. Any of these can be adjusted to tailor the analysis, and we will continue to innovate and update the inputs as the market changes in the future.

On the demand side, we've collected data on emissions, emission reduction targets, profits, sectors, employees, and more, for thousands of companies – those in the VCM, and those who may buy credits in the future. We also track voluntary-compliance market consolidation, allowing us to understand how cap-and-trade and carbon taxes may impact the VCM. This means we can project likely credit needs at a company level, aggregate them across the market, and overlay compliance schemes to **generate highly sophisticated demand scenarios.**

Overlaying supply and demand allows us to generate a price for each sector, in each country we track, for every year into the future, until 2050 and beyond.

The timing of this release is not coincidental. Firstly, we've been testing, prodding, and double-checking our assumptions since we first **teased the model** back in July. A clear point of feedback on the initial outputs was to **incorporate country-level assessments, which we've spent the last six months incorporating.** We're at the point where we feel the model is product-ready, and we're excited to share it with our existing and future customers.

Secondly, with Article 6 allowing countries to begin trading emissions reductions, we believe the model should become an essential part of **ministers' toolkits on how to maximize their countries' potential for the VCM**. In addition to highlighting the sectors that are most likely to flourish in the coming years, the model can help policymakers set fair and well-thought out carbon taxes to maximize revenue, as well as enabling them to understand the **potential for job creation by sector**. This can lead to tangible economic benefits while lowering emissions, globally.

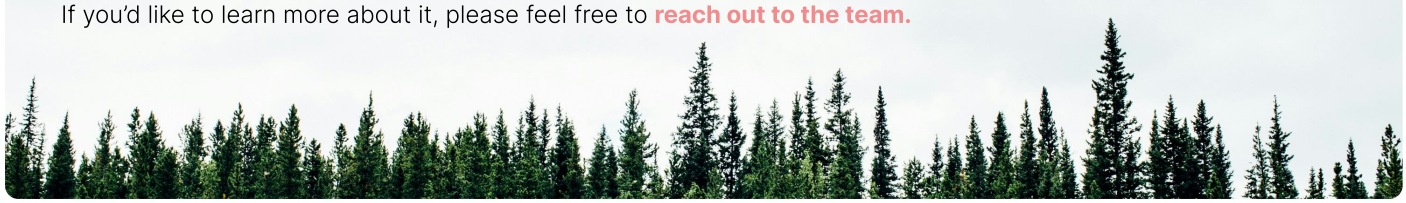
Finally, with the market's future as uncertain as ever, this analysis can help stakeholders **make informed decisions about whether and how to engage with the VCM**. The analysis from our model is clear – with even minimal demand, there are likely to be financial rewards for investing in projects that reduce or remove carbon dioxide from the atmosphere, while also bringing much-needed capital to underserved parts of the world. Investors (whether public or private) that can pick out those trends today stand to benefit tremendously; they'll also be on the forefront of combatting the key challenge facing the world today.

Of course, nobody knows how the market will look in 2, 5, or 25 years' time. But by modeling scenarios around companies' decarbonization strategies, governments' policy implementations, and more, stakeholders can understand the potential impact on their VCM strategies, and create an informed opinion around how to engage with the market."

by Anton Root

This report introduces the model, provides a **sample of outputs**, and discusses how it can be used to inform strategy.

If you'd like to learn more about it, please feel free to **reach out to the team.**



Summary
Data Overview & Key Numbers

Projected Credit Retirements by Region (Base Case Scenario)

Region	2030	2035	2040
Asia	169m	232m	386m
Americas	110m	256m	347m
Africa	99m	133m	162m
Europe	39m	83m	122m
Oceania	27m	41m	47m

Demand & Market Size Forecasting (Base Case Scenario)

1.1
billion tons

By 2040, we anticipate the market will reach ~1b tons of credits in demand, growing by 4.5 times from today's volumes.

$40
billion

Our model projects the primary market value to reach $40b by 2040 (in nominal terms).

Market Average Price Expectations

Low

$11/ton

In this scenario, the low demand and the high oversupply of credits in the market today keep prices low, which reach $10.88 (in nominal terms) in 2040.

Base Case

$35/ton

We project prices to increase quickly in the early 2030s, reaching a market-average price of $32.6 /ton (in nominal terms) by 2040.

High

$63/ton

In the high case, however, we expect prices to reach more than $63/ton (in nominal terms) in 2040, and to continue growing from then.

A Data Driven Approach to Carbon Market Forecasting

AlliedOffsets is the leading data and analytics firm for the VCM. We track more than 35,000 projects from dozens of registries (as well as unregistered removals projects), 16,000 buyers, billions of credit issuances, prices across the market, and much more. This data allows us to create industry-leading insights into the VCM.

To date, these have informed current trends in the market. Now, we are using this data to create forecasts for how the market may develop in the future.

In simple terms, we use our experience in data, as well as feedback from project developers and academic research, to understand what projects can be viable at what price points, and where. In other words, if a buyer approached the market and was willing to purchase credits at (say) $10/ton, which projects would be able to generate credits at or below that price point, and where would those projects be?

Understanding the Cost of Carbon Credit Projects

The key input into the model, then, is the minimum cost of setting up a project. Even within a given sector, this is not always uniform: project costs vary considerably by region, developer experience, and project business model. However, there is generally enough similarity to be able to create a model, and adjust the inputs by location (and other factors). We obtained the project setup costs by speaking with developers, poring over academic research, and examining projects' financial models. We also examined our data to understand the price level at which projects began to register, and how many of them registered, which provided insight into how quickly a sector can ramp up, once prices meet the minimum setup costs.

Of course, there is no single price point for credits in the VCM. This means we also model a willingness to pay for credits, which depends on the prices we see in the market today. For example, even though prices, as a weighted average, are around $4/ton today, there are companies willing to pay $20/ton or more for nature based removals. This price premium (or discount) changes over time and as average prices change: buyers who are currently willing to pay a 5x premium for ARR credits may not have the same appetite when average prices reach $20/ton. In other words, the willingness to pay for credits changes as prices rise and fall, and as certain technologies become cheaper in the future.

Projecting Demand for Carbon Credits in the Voluntary Carbon Market

On the demand side, a key assumption is around the price elasticity. Often, people talk about demand in the market as if it's inelastic: demand would be X million at any price. However, that's highly unlikely given the voluntary nature of the market – as prices increase, demand drops. The shape of the demand curve is an important input into the model, and as we track retirement numbers at each price point in the market, we are uniquely positioned to know demand levels at each price point in the market.

The most important inputs on the demand part of the model, however, are the number of credits we anticipate will be sought by companies each year in the future. These inputs are built on company emissions, company targets, internal price of carbon, profits per ton emitted, compliance market links, and much more. Nobody knows how many credits will be retired in the future, but we are best placed to make educated guesses based on inputs that are likely to materialize.

Continuous Improvement in Our Carbon Forecasting Model

These assumptions, and many others, are explored in **depth in our wiki**. We hope that by being transparent about not only the list of assumptions, but the inputs themselves, we'll be able to build trust in our approach, solicit feedback, and update inputs when needed.

Based on the above assumptions and inputs, we generate a forecast by matching supply to the input level of demand. The model works by testing a price to see whether the number of credits supplied are enough to meet demand. If supply in the market is not high enough to meet demand, we anticipate prices will go up and projects will begin to be set up by developers. If prices are too low, the over-supply of credits in the market increases, and developers issue only a portion of the credits they are able to. Once an equilibrium is reached for the given year, it moves onto the next.

Do you want to explore how the model can support your specific use cases?

Get in touch

Scenarios & Model Applications

Base Case Scenario

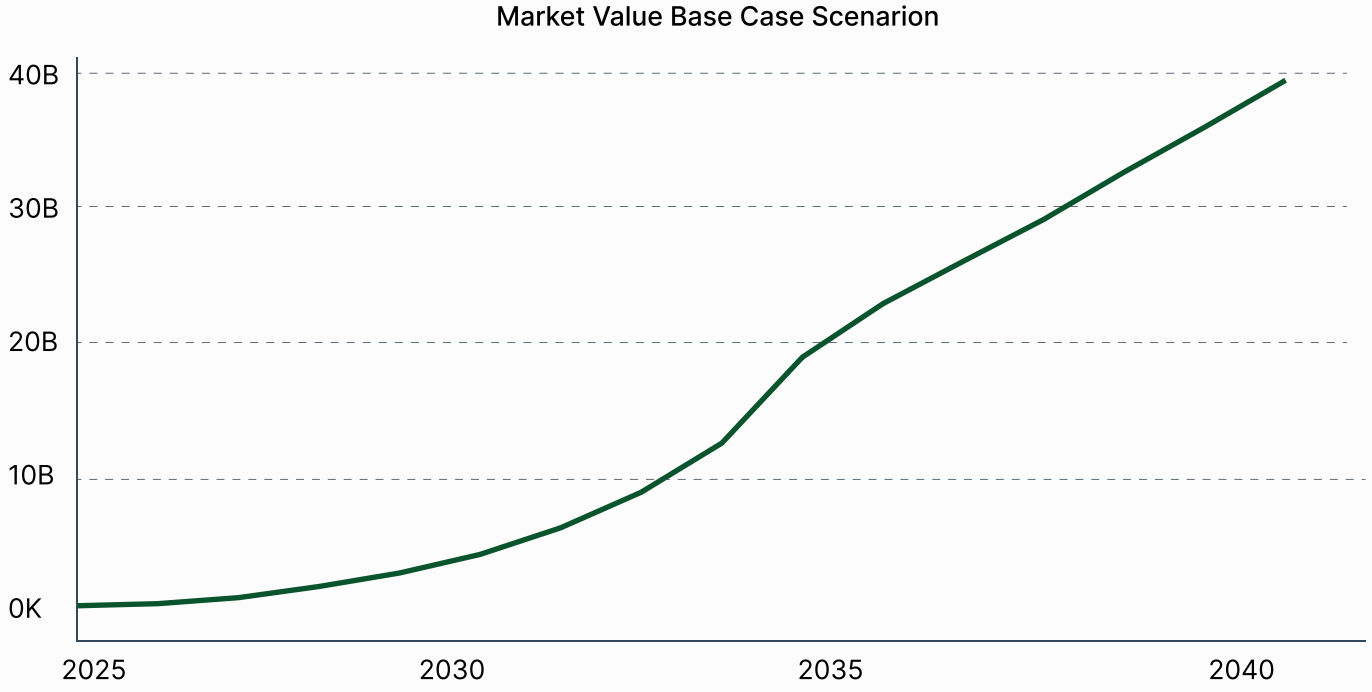
The base case below projects a growth scenario that sees companies offsetting a portion of their missed targets. As an example, a company that plans to lower its emissions from 2m to 1m, but can only lower its emissions to 1.2m may offset a portion of the 'remaining' 0.2m tons.

For the base case, the demand scenario used is around companies' use of credits to offset missed targets. This case assumes companies offset 25% of missed Scope 1 and 2 targets, and 20% of missed Scope 3 targets. We also make assumptions around what price the demand is valid for, and the elasticity of demand when prices are higher or lower.

We expect the market to grow slowly until 2032, as oversupply of credits means that there are enough credits to satisfy demand until that year. **See page 7** to learn more about how the oversupply of credits affects the market, but the base case illustrates clearly that prices will remain low across the market, if the excess credits remain in the market.

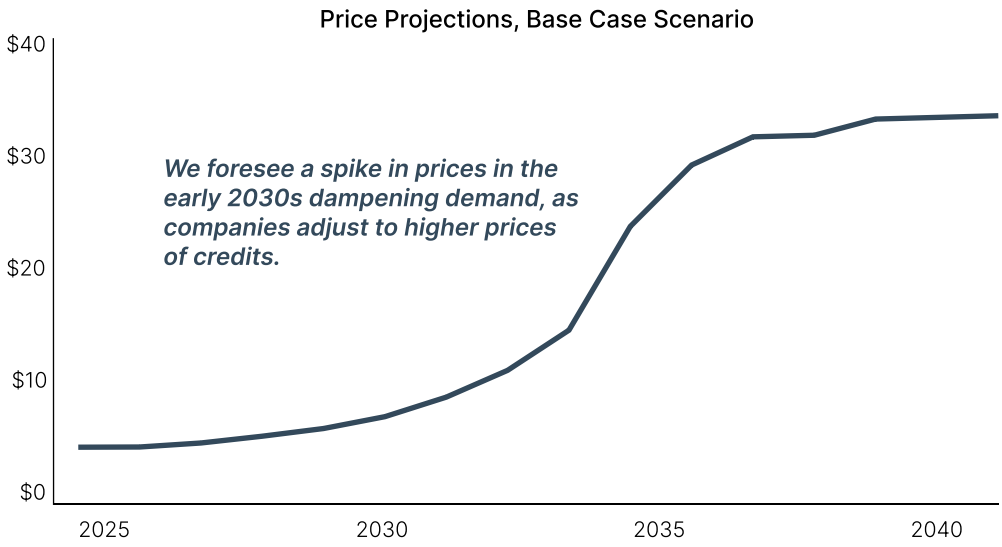
The primary market value (the number of retirements multiplied by the price of those retirements) stays in the single digits until 2033, at which point it quickly increases, reaching ~$40b by 2040 (in nominal terms).
We project prices to increase quickly in the early 2030s, reaching a market-average price of $30/ton (in nominal terms) by 2035. This average price belies the complexity of prices for each sector in the market, which sees prices differ by project type.

Our model looks at prices as buyers' willingness to pay for credits from a sector. Once prices for that sector reach the break-even point, credits begin to be generated; until then, the sector remains relatively dormant. This is especially important for the high-cost engineered removals sectors.



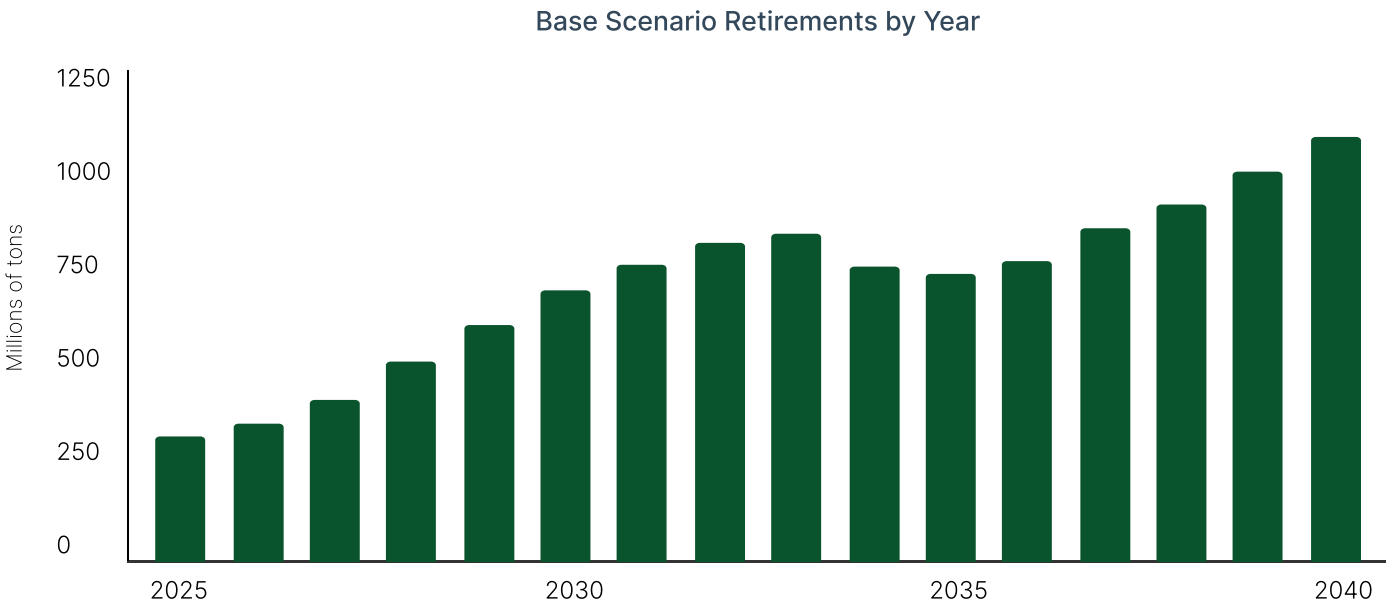
The base case shows prices plateauing in the late 2030s as the market reaches a temporary equilibrium.

The number of credit retirements reaches 1b in 2039, quadrupling the volume we've seen in the last several years. We foresee a spike in prices in the early 2030s dampening demand, as companies adjust to higher prices of credits. **However, we anticipate growth in retirements to continue after the initial shock response to the price increase.**



Scenarios & Model Applications

Base Case Scenario



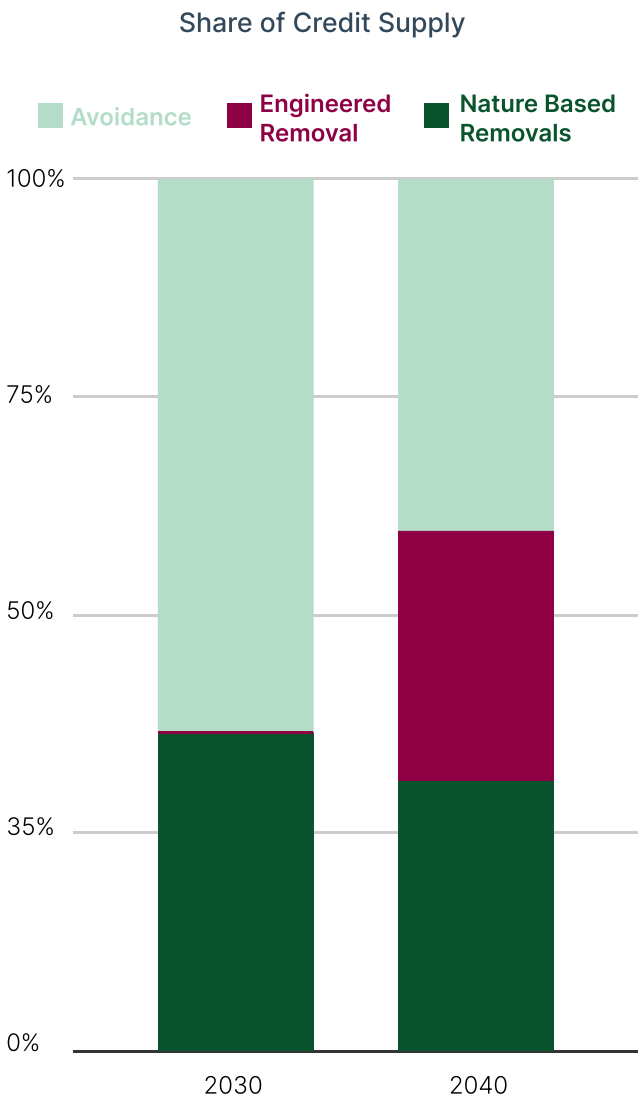
Focus on energy efficiency & nature-based and engineered removals

We expect the market to change considerably in the next 5 years – and even more by 2040. In the next 5 years, we forecast energy efficiency and waste disposal projects to become more popular as the VCM becomes increasingly used to fund the energy transition; waste sector projects benefit from countries' desire to curtail methane emissions.

By 2040, a focus on nature-based and engineered removals, as we near 2050 net zero targets, means these **projects issue nearly 60% of the credits in the market**, with ARR credits alone making for 20% of the market. Technological advances in engineered removals (DAC, BECCS, biochar) mean that those projects become economically viable and reach hundreds of millions of retirements.

Our base case, compared to other models in the market, is fairly conservative. **By 2040, we anticipate the market to reach only ~1b tons of credits in demand. Relative to CO2 projections, 1b tons is very likely to be less than 5% of global emissions.**

Still, this would represent a 5x increase to the demand levels we see in the market today; given the slow pace of voluntary-compliance market integration, political and economic headwinds, and increasing demand for energy in developed countries, we think a conservative outlook is appropriate. We will update the forecast on a regular basis in order to capture latest developments in the market, both for supply and demand of credits.



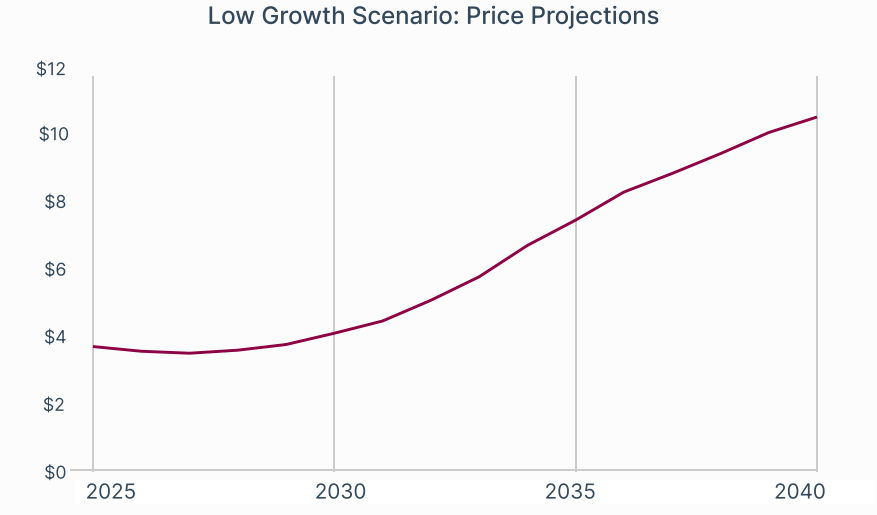
Scenarios & Model Applications

Low & High Growth Scenarios

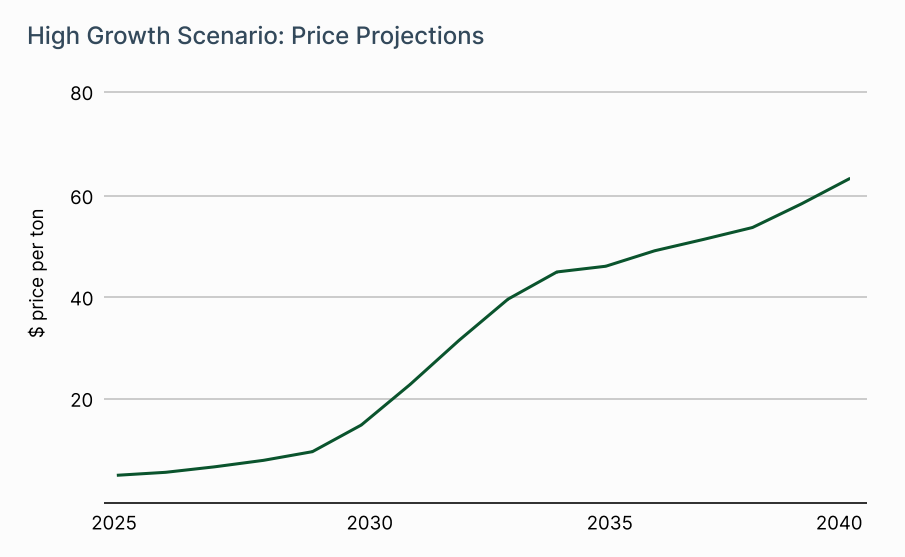
Low Growth Scenario

In addition to presenting our base case, we'd also like to share a low growth scenario and a high growth scenario. The low growth scenario sees demand for credits effectively plateau for the foreseeable future, only reaching 425m retirements by 2040. The dampened demand and the high number of issued but not retired credits in the market today keep prices low, which only reach double digits in the late 2030s.

The low prices mean the engineered removals part of the VCM fails to take off, representing only 1% of the market by 2040. Nature based removals still grow, but represent less than half the market, and reach, in absolute terms, only 150m tons in retirements by 2040.



High Growth Scenario

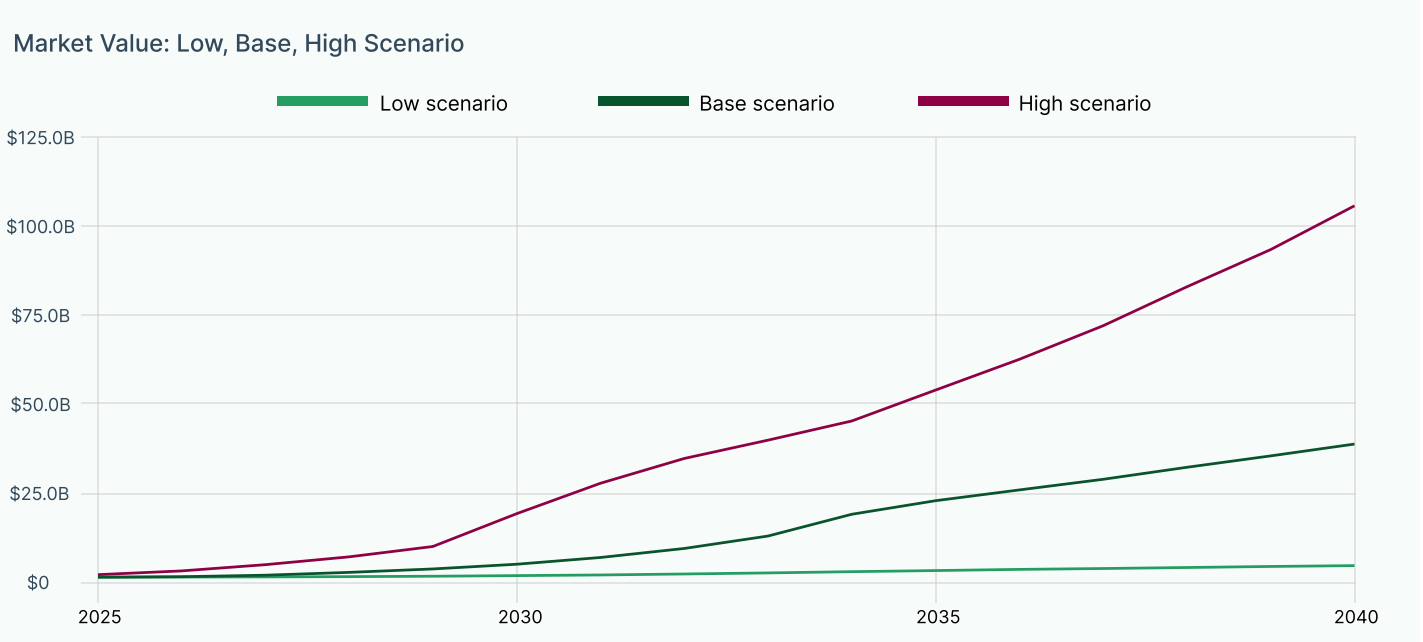


Growing Share of Engineered Removals Driving up Prices

In the high growth case, however, we expect prices to reach more than $50/ton (in nominal terms) in 2037, and to continue growing from then.

In this scenario, engineered removal projects become profitable earlier in the future, meaning that by 2040, they are responsible for half a gigaton of credits issued and retired. The overall market value reaches triple digits in 2040.

We summarize the three scenarios below. The nominal market value is more than 20 times greater in the high scenario than in the low scenario – representing the diverging visions for the market.



The Importance of Oversupply in the Voluntary Carbon Market

Oversupply in the Market

Most of our scenarios predict prices to stay low for the next several years. This is for a number of reasons, but a key one is that the number of credits that have been issued over the past ~25 years into the market, but have not been retired.

This oversupply currently sits at over 1b tons – meaning that if projects issued no new credits, there would be enough supply in the market to meet demand for more than four years.

There are a few ways we deal with this in the model: firstly, we discount credits as they age – this reflects buyer preference for more recent vintages. In practice, companies tend to prefer new credits as they can match them against recent emissions – credits that haven't sold after 10 years may never be retired. Secondly, the way projects issue credits is tied to the price of credits in the market – when prices (and demand) are low, projects are unlikely to issue all of the credits they can for a year. Instead, they'll issue only the portion of credits for which there is a buyer, which again reflects what we experience in the market.

However, the most effective ways to reduce this oversupply can only be done in the real world, not in the model. **The first way is to increase demand, retiring the oversupplied credits. The second way is to take the credits out of the market.** The latter is a drastic approach, but it is one that's seeing some early traction in the market. ICVCM's Core Carbon Principles, for example, could be interpreted by buyers to be a minimum, binary threshold of quality – credits that do not have the CCP tag may effectively become obsolete as buyer sophistication grows and they determine these credits to be too low in quality. (To be clear, ICVCM does not advocate for this position.) Alternatively, entities like ratings agencies or project advisers may convince buyers to retire more than 1 credit to offset 1 ton of emissions. This is already employed by companies like Rubicon Carbon, whose Rubicon Carbon Tonne 'risk-adjusts' a ton to mitigate potential overcrediting, by retiring credits on nobody's behalf.

This approach is not going to be popular with many in the market – but it would help lift prices from a multiple year slump, and directly address claims of project overcrediting.

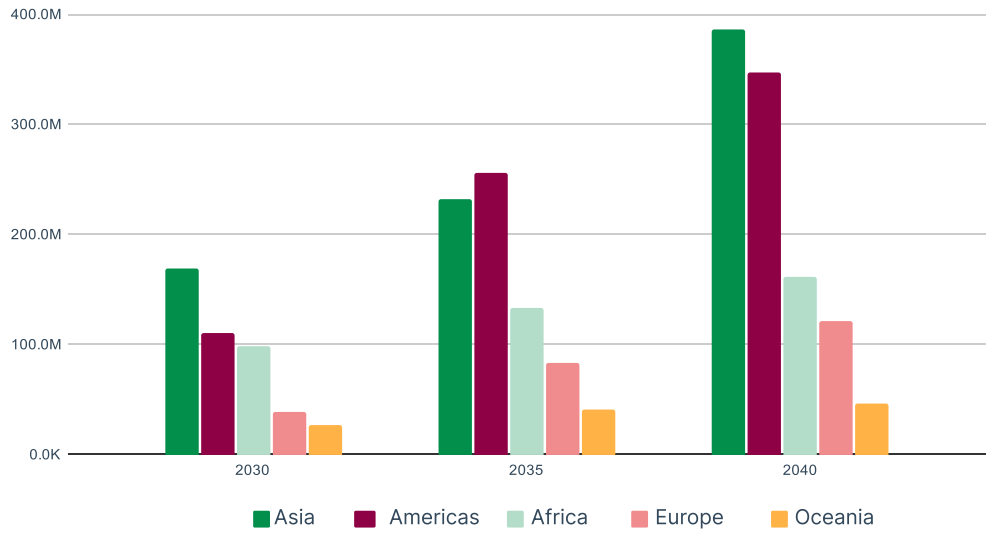
Scenarios & Model Applications

Regional Example: Asia

The VCM's Potential in Asia

Asia is a leading region in the VCM, with China and India currently leading the way in terms of the number of projects that have been set up in those two countries, as well as the number of credits that have been issued since the market's inception. **We expect this dominance to continue into the future.**

Regional Activity in 2030, 2035 and 2040



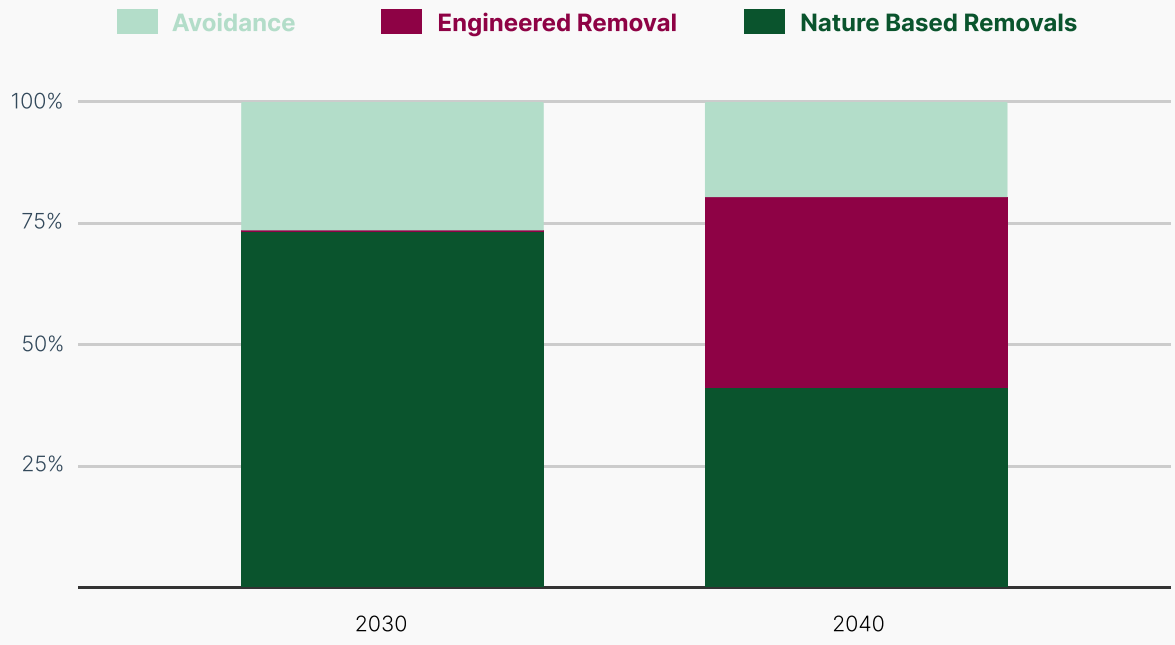
In our base case scenario, we anticipate that China and India will both stay in the top 5 countries by credit retirements as of 2040.

As the region with the most potential for nature based removals, we expect the Americas to overtake Asia briefly by 2035.

By 2040, however, Asia will regain its position as the VCM leader, driven by a high proportion of engineered removal projects launching in the region.

In addition to China and India, we forecast Indonesia, Bangladesh, and Turkiye to also significantly contribute to the issuance of credits in the market, with these five countries contributing more than a quarter of the credits issued in the market by 2040.

Share of Credit Supply by Project Type | Asia



Model Applications

Future Employment

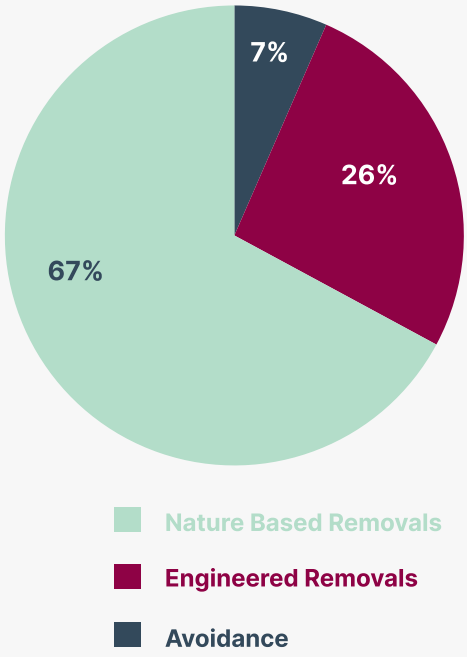
Forecasting Employment Opportunities

The VCM can not only mitigate and reverse climate change, but it can also help to bring **economic benefits** to many underserved communities in emerging economies. The charts on this page show the number of people we forecast will be directly employed by the VCM in the base case scenario. This is coming only from new projects that we forecast will be launched in the future, meaning the employment numbers from existing projects are not counted in this dataset.

The employment numbers are calculated by taking the average number of people employed by projects in a sector (data we extract from project design documents), and applying them to the number of projects we forecast will come online in the coming years. **Asia stands to gain the most, with over 1m new jobs directly created by the VCM.** Most of these will come from the removals part of the market, which tends to employ more people.

To put the numbers into perspective, the Aviation industry employs roughly 2.5m people globally, between airline and airport operators, aircraft manufacturers, and regulatory and maintenance staff.

Employment by Project Type



Direct Employment Created by VCM Projects