

Landscape of the Carbon Offset Market

August 2020



Executive Summary

Foreword

The adverse effects of **climate change** resonate with an increasing number of people. From the Australian bushfires to record-setting temperatures in the Arctic, extreme weather events **are becoming more common, more dangerous, and more heeded than ever.**



This is driving interest in a major cause of climate change – increased carbon emissions – and what governments, companies, and individuals can do to reduce their carbon outputs.

Companies from around the world are pledging to reduce their carbon emissions in the coming years; individuals are also looking into what they can do to shrink their carbon footprint. One method has been carbon offsetting – a product that (in theory) allows anyone to offset their carbon emissions by funding a project somewhere in the world that will remove the corresponding amount of carbon (or an equivalent amount of another greenhouse gas) out of the atmosphere.

The efficacy of offsets, and whether they actually do what they claim to, has been a hotly-debated topic from the moment they were implemented; many reports document their pitfalls. And yet, there is promise that

good projects and verifiable offsets can help the world during the transition to a low-carbon future.

An increasing number of startups are coming into this space looking to use technology to increase transparency and monitoring. Others are looking at blockchain to make the market more efficient. However, there is still little data on the carbon market itself: projects live on several registries that report different data, making it hard to get a sense of the landscape.

That was the reason for [AlliedOffsets](#), a database of carbon offset projects created by AlliedCrowds. There are opportunities in this market that are poorly understood because of scarce data, and we hope that this database makes the carbon offset market better known, more accessible, and more transparent. If the market is to improve, knowing what works and what doesn't is crucial.

In this report, we introduce the database and some of the issues around carbon credits. At first, we're starting with the four largest voluntary registries, as well as the UN's CDM. In the future, we will be adding more registries to get a more complete picture. We've spoken with a number of leading experts in the field, have taken stock of some of the most innovative firms in this space, and have crunched the numbers to bring you a truly unique report. This product is a work in progress, and we will continue to enrich and improve the data in the coming years -- today's dataset is just the start. We hope you [enjoy the database](#), and if you have any questions, feel free to reach out to carbon@alliedcrowds.com.

Anton Root
Head of Research

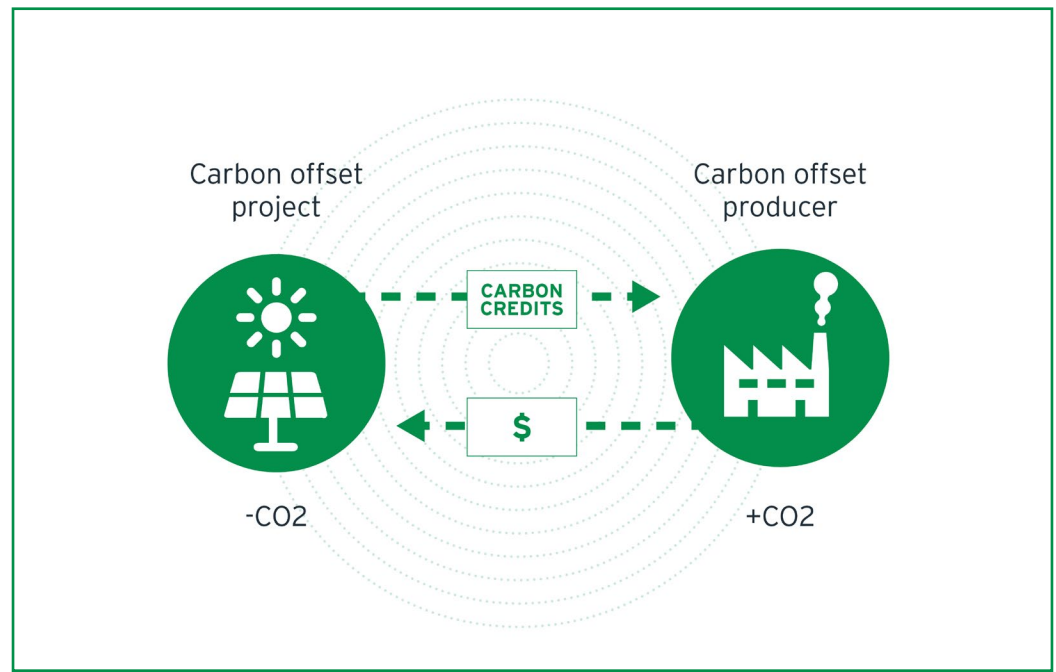
Introduction

What is carbon offsetting?

Carbon offsetting is a financial instrument that aims to counterbalance the release of carbon into the air.

"In a post-Kyoto Protocol era, carbon-constrained world, GHG mitigation in all its forms increasingly has financial value."

World Bank



Offsetting enables individuals and companies to discount their environmental impact by investing in projects that reduce the amount of harmful substances going into the environment. A buyer can purchase carbon credits, which are tradable certificates measured in tonnes of carbon dioxide or an equivalent amount of a different greenhouse gas (tCO₂e); they allow the owner to emit 1 tCO₂e. To help visualize this, a tonne of CO₂ is roughly the size of a balloon that is 10 meters in diameter.

[The Kyoto Protocol formalised](#) mechanisms for trading carbon, leading to one of the earliest compliance markets for carbon offsetting -- the Clean Development Mechanism (CDM). This required certain industries in particular countries to offset a portion of their emissions. Since then a separate voluntary market for offsets has emerged. Voluntary markets are neither legally mandated nor enforced: they are a market for those who want to offset their own emissions. Compliance markets face strict regulation; voluntary programmes are largely self-governed.

The most recent [Ecosystems Marketplace report](#) has signalled that over time voluntary and compulsory markets have begun to blur somewhat: "When EM first started tracking voluntary carbon markets in 2006/7, the Kyoto Protocol's CDM had just come into being, and the division between compliance and voluntary markets was clear...this boundary began to blur in 2012 when California (and Australia, at that time) incorporated methodologies that had been developed in the voluntary market into its cap-and-trade system. This sparked a trend of more and more compliance programs recognizing offsets developed under such methodologies." In particular we have seen the CDM introduce lots of their credits into voluntary markets -- as such they feature in the first iteration of our carbon database.

Top Carbon Offset Registries

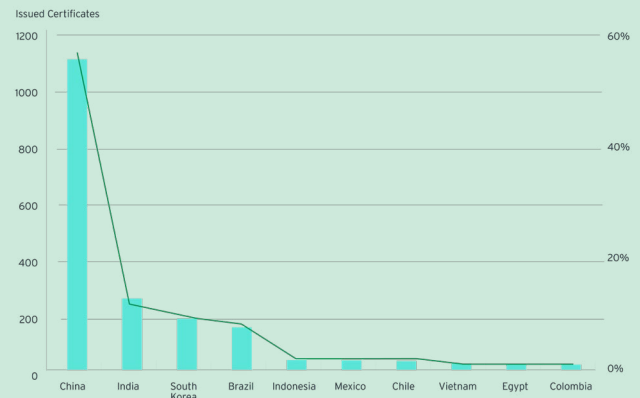
To the right are the four leading voluntary carbon offset registries, as well as the UN's CDM market, that are included in our analysis. As we grow and continue to improve our database, we will add other registries.



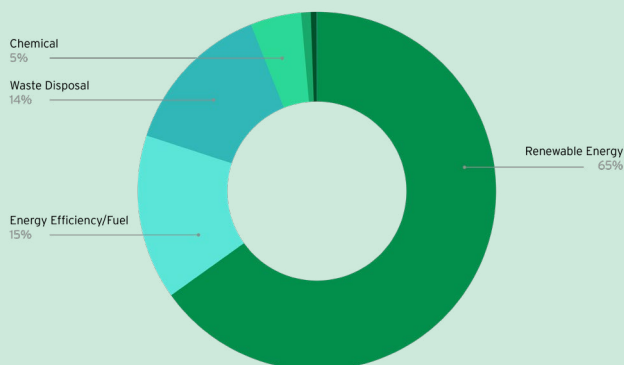
A Close Look at the UN's CDM

The CDM was the first global compliance carbon offsetting market. Below, we take a look at some of the data behind the projects on there.

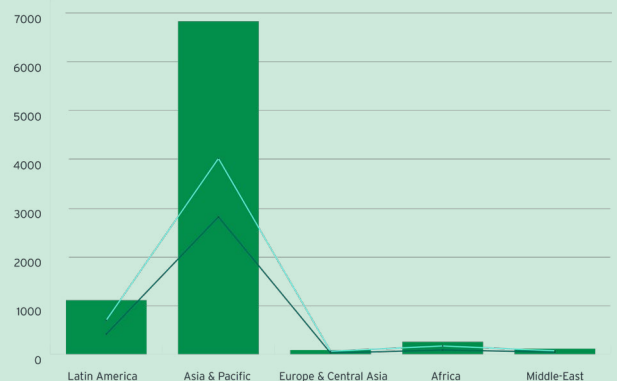
Top 10 Countries by Issued Certificates



Frequency of Project Types



Regional Distribution of CDM Projects



What are carbon footprints?

Understanding our impact on the planet is integral to learning about how we can change our behaviors. Whilst this sounds fairly trivial, calculating the impact of every action we have on the environment is incredibly complex. Offsetting only works if we can first quantify and understand our own impact, before trying to find the right kind of offsets to mitigate the emissions we can't personally cut out.

There are several online tools that are helping people to better understand their impact on the planet. Below, we have compiled some research into a range of activities' impact on the environment, based on UK DEFRA statistics. Appreciating the scope and pervasiveness of our everyday lives' impact on the planet is a good first step along the path to reducing our personal carbon footprint.

CO2 Emissions per Activity

Running
Dishwasher at 55C



1.3kg CO2e

Riding
a Taxi (10mi)



3kg CO2e

Short Haul
Flight (874mi)



219kg CO2e

Long Haul
Flight (6000mi)



1840kg CO2e

Annual CO2 Emissions per Ton of Waste Type in Landfill

Glass



8kg CO2e

Clothing



445kg CO2e

Organic food
and drink waste



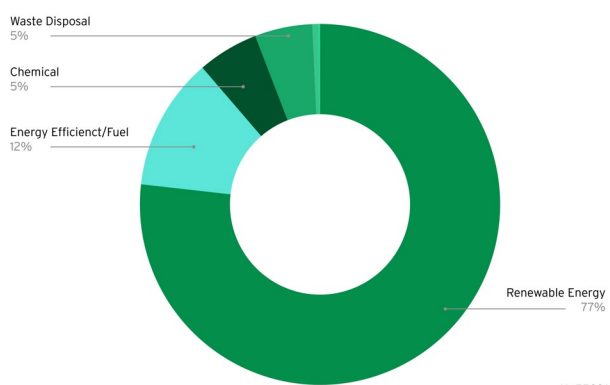
627kg CO2e

A Look at Two Major Players

The USA and China are the two largest economies in the world; they are also the largest nations in the Voluntary market and CDM respectively. A quick look at how their offsetting industries operate captures some broader offsetting dynamics.

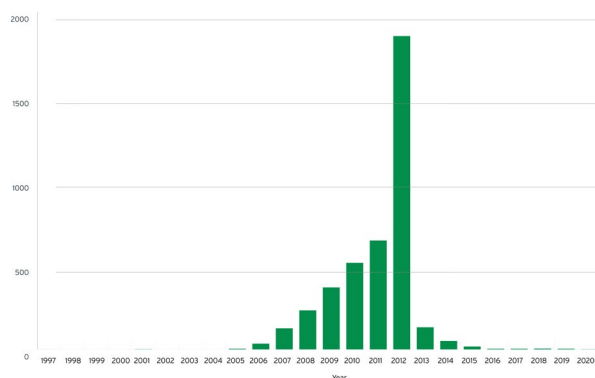
Distribution of Project Type

China



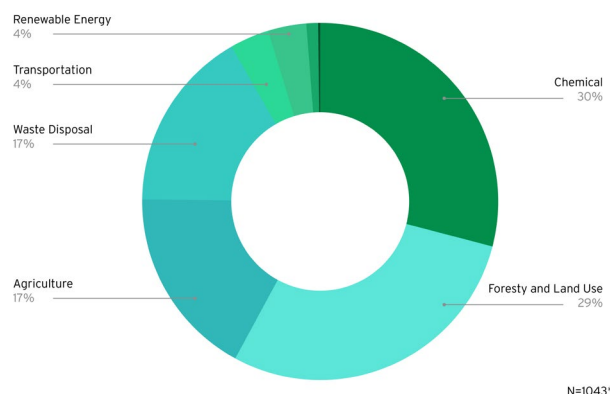
New Projects per Annum

China



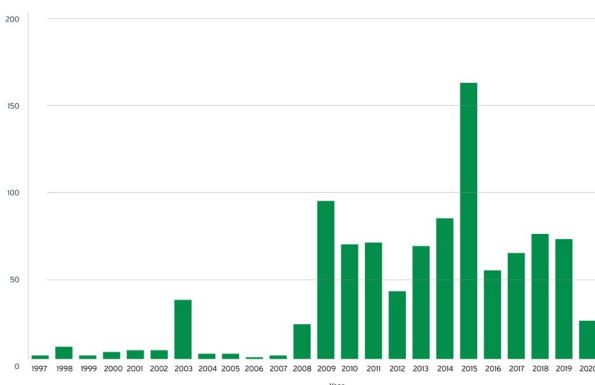
Distribution of Project Type

USA



New Projects per Annum

USA



Appetite for Offsetting

While the debate is ongoing about the efficacy of offsets, most tend to agree that it's a necessary step to encourage accountability whilst more permanent solutions are developed.

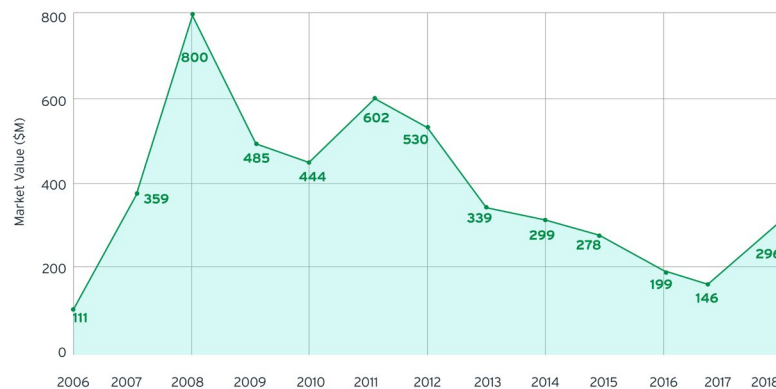
"Many companies are turning to carbon offsets to meet climate promises around net-zero emissions and carbon neutrality."

Suzanne Greene, MIT

Recently, we have seen a rise in demand for offsets. As people are becoming increasingly climate conscious and demanding more from businesses, a growing number of industries are making commitments to carbon-neutrality; 2018 snapped a 7-year run following the last financial crisis where the voluntary market had been shrinking. MIT's [Suzanne Greene](#) noted, "Many companies are turning to carbon offsets to meet climate promises around net-zero emissions and carbon neutrality."

Market Value

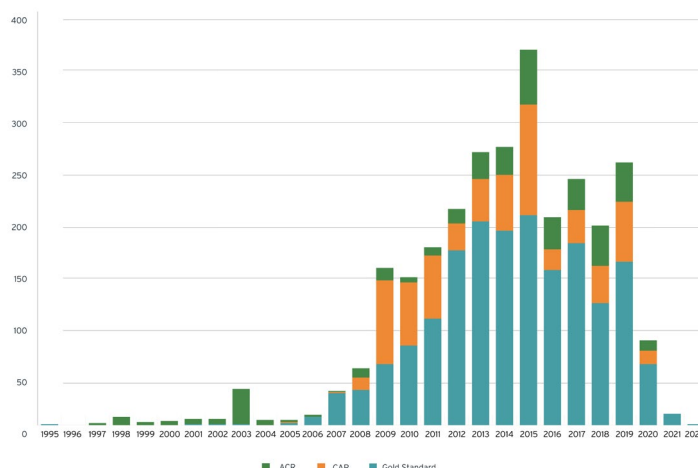
Voluntary Market



Ecosystems Marketplace

New Projects per Annum

Voluntary Market (not including VCS)



Johann Hannes Thaler, a former project developer across Africa and South America and technical expert at the Gold Standard, discussed the new surge in demand and its likely emergence from businesses: "I'm seeing a lot of companies at the moment who want to offset, and the scale they're demanding is in the millions... Usually big corporates and some SMEs are purchasing these projects' credits, and this is projected to increase. Funds like the idea of having carbon incorporated into their business model, and it is increasingly becoming a component of companies' risk strategy. At the moment we're seeing big companies who left the market in 2012 now returning."

The breadth of the demand is a signal of market optimism, establishing a stronger base for [future carbon markets](#): "Market observers say that demand in 2019 was broad-based and mostly driven by new entrants to the markets. This is in contrast to previous years, when our analysis found that as much as 80% of new volume came from old customers"

"Many feel the need to secure credits today because they worry they may not be there in five years' time."

Ecosystem
Marketplace

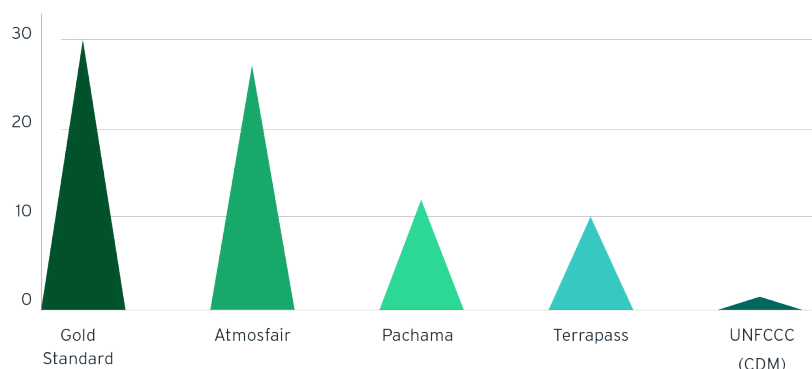


Growing business demand also displays an anticipation of further climate requirements from policy in the coming years. Recent international elections have showed an increased willingness of governments to engage with climate-related topics. In the wake of growing climate movements amongst governments and consumers alike, [businesses are rushing to offsets](#): "Many feel the need to secure credits today because they worry they may not be there in 5 years' time. For companies who are demanding huge volumes, they are concerned that the time to get them at a low price may be slipping, and so there's a risk that if they do not get the credits now they won't be able to do so in the future." A forward market would be helpful here, allowing companies to lock in the price of carbon offsets into the future in order to minimize uncertainty.

Though there is growing excitement about carbon offsetting, the market is still in its infancy, and problems persist.

Price per tCO2e

For how much can one purchase a carbon credit across various vendor platforms?



Informational Asymmetries

“There isn’t one specific place you can go to see every single carbon credit that is generated, they are spread out through several registries.”

Aaron Shavitz,
Native Energy

One of the difficulties in the market today is the lack of transparency, caused by informational asymmetries. As noted by Aaron Shavitz, an analyst at [Native Energy](#): “There isn’t one specific place you can go to see every single carbon credit that is generated, they are spread out through several registries.”

Without a single database where developers and buyers can go to look at offsets around the world, the nature of producing credits and buying them has become distorted. This creates barriers for individuals to run projects and cheaply sell credits to buyers, as identified by Simon Bird, a director and project developer at [Wildlife Works Carbon](#): “The cost of consumer marketing is prohibitively high because you have to educate the consumer on what each standard means and what each credit does.” Despite the [increasing number of entrants](#) to the market, this doesn’t necessarily make things easier for project developers, according to the most recent Ecosystem Marketplace report: “The influx of new buyers could be a double-edged sword... analysis from previous years suggests that first-time buyers, as well as buyers who purchase only for compliance purposes, tend to be more focused on price than quality. Interviewees did not say that is happening now, but many identified customer education as a key challenge going forward.”



The process of selling your own credits is highly complex. Speaking with Mr. Bird, he shared his thoughts on this topic: “It is a very complicated process to sell your own credits.” He continued saying, “The fragmentary nature of the market requires a level of sophistication to market that NGOs often will not have... You need to have an understanding of what you have, why it is valuable, and then connections into the door of large companies who will buy millions of credits at a time. You can generally receive much higher credit prices for sales to private individuals, but the sales volume is very low and the transaction costs are high, so it is hard to make it work.” Without any kind of central informational database, the market creates clear constraints on project developers, excluding many potential entrants.

For consumers’ decision-making process, information is also key; evaluating projects holistically before purchasing is important to ensure that the offsets on the market are achieving the greatest impact. With the information currently available, buyers find it difficult to make these choices. The result is a market where features of the offsets that do not improve environmental or social outcomes are being prioritised. This perspective is shared by MIT’s Suzanne Greene: “A problem at the moment is that many companies prefer to purchase carbon offsets that might provide a warm, fuzzy feeling for their consumers... Climate impacts, values, and offset purchases should be aligned, but at the moment, they rarely are.”

Price of Credits: How Can 1 Credit Range from \$50 to \$0.50?

“The market is very fragmented, and as such it is difficult to see prices - there is no real transparency.”

Simon Bird,
Wildlife Works Carbon

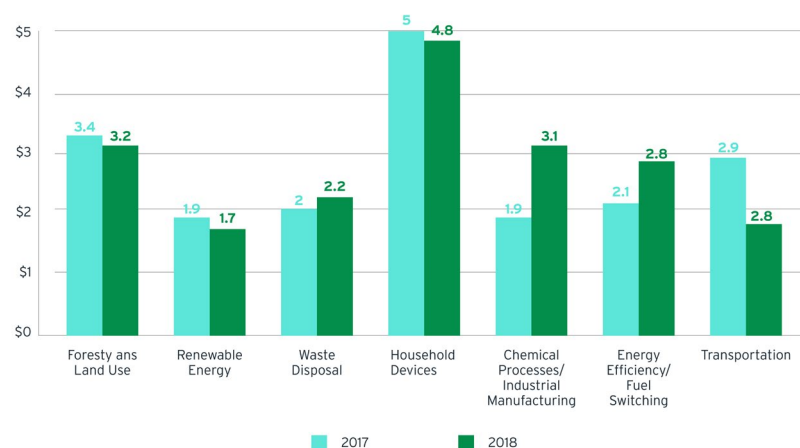
The nature of pricing in the market encapsulates the informational asymmetries present, summed up by Wildlife Works Carbon's Mr. Bird: “The market is very fragmented, and as such it is difficult to see prices – there is no real transparency.”

How offsets are priced has little structure. Ranging from 50c to over \$50 per credit, the fluctuations are determined as much by the market sentiment towards the project type as the underlying cost of production. We discussed this with Luke Howard, a Project Officer at the [Plan Vivo Foundation](#), who brought up some of the extraneous factors that can motivate how prices are set: “The variation in prices depends on the project type, size, co-benefits, location, bartering capacity of buyer and seller, and considerations of retail vs. wholesale purchasing. The market acts similar to a free market economy.” The bartering capacity of the buyer and seller as a component of price fluctuation is particularly concerning given certain businesses preferences for projects' marketability rather than environmental and social benefit. Our discussion with Mr. Bird highlighted the impact of buyer preferences in this process: “The motivation of the buyer will impact the price. Are they only looking for a commodity to trade, or are they a consumer brand who cares about the story of the credit which they can promote as part of their PR? These are some of the variables that cause the prices to vary dramatically.” As we see more project developers having to build relationships with specific businesses to sell their credits, the motivations of buyers will become increasingly important in the kind of credits we see being supplied. Without the right kind of information for buyers, the resulting consumer pressure will have negative environmental and social consequences.

An [Ecosystems Marketplace](#) analysis provides the only view on pricing in the voluntary space; unfortunately, even this lacks any significant degree of granularity on registries or geographies. What is telling here is the price of forestry credits – second only to household devices such as cookstoves (which in themselves are microprojects) the price of forestry credits seems more a product of the ‘fuzzy’ feeling Ms. Greene raised, rather than underlying cost or production. In simple terms, if you only care about buying credits as cheaply as possible, for the same amount of money you'd get close to three times more credits from renewable energy projects that from household devices.

Average Prices for tCO2e

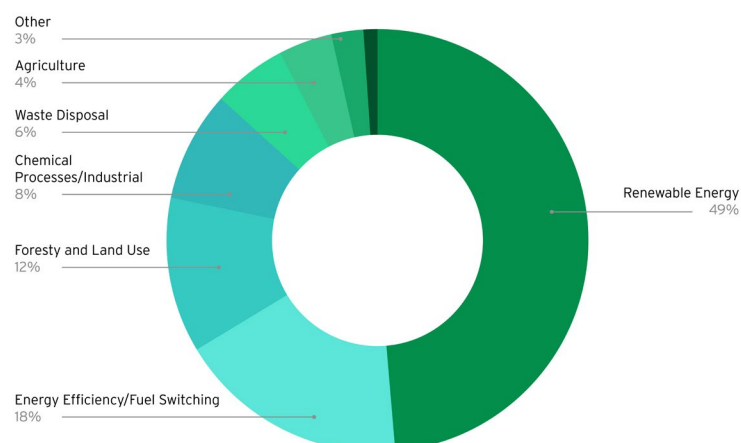
Voluntary Market 2017 vs. 2018



Ecosystems Marketplace

Frequency of Project Types

Voluntary Market

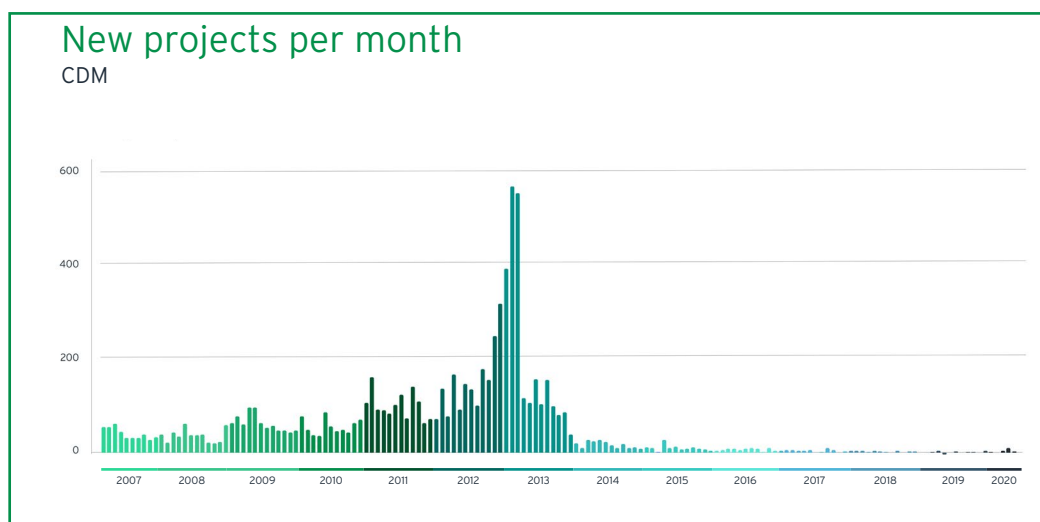


"The price of credits is so low the projects cannot survive."

Dr. Jørgen Fenhann,
Technical University
of Denmark

Using analysis from our new data, we can see that supply of credits can't be a determinant of forestry credits' value; with supply both greater than waste disposal but lower than energy efficiency, we might expect a price in between the two, but as we have seen its price surpasses both. Evidently non-economic factors play a role in the price of offsets. For someone who wants to remove a tonne of CO₂ out of the air, it's not clear that this will happen by just buying the cheapest credit, as there are trust concerns introduced when price differences are so vast.

The crash of CDM prices around the last financial crisis is a further example of how pricing is hurting the offsetting industry. Dr. Jørgen Fenhann, a senior scientist at the Technical University of Denmark and member of the [UNEP DTU](#) partnership, noted that an alarming number of CDM projects ended up becoming dormant due to the unexpected crash in prices: "Of the 12,000 projects on the CDM, around 8,000... can create credits, but around half of them never have. Many of these projects are registered but the price of credits is so low the projects cannot survive." Project developers who registered with the CDM pre-2007 had a perspective on what their credits would sell for in 2-3 years time when their projects went live. Due to the lack of transparency in the pricing dynamics, they were not able to foresee the price crash that would ensue, and therefore had no option but to let their projects go dormant. Following this, the number of projects registering with the CDM has completely collapsed: "The number of new projects on the CDM registry has fallen significantly. At its peak there were around 100 new projects every month, now there are maybe 2."



Christian Pauw, a project developer with [Nova](#), highlighted the flaws in the creation of the CDM that led to this crash: "CDM prices imploded because both the credits and those who set up the framework were insensitive to the economic environment around them. When Kyoto was signed they had an idea of how the world economy was going to grow, but in 2008 this growth was lost. The allocations, however, remained there. When global economic demand crashed allowances did not correct in supply, and the prices suffered as a result."

Establishing greater transparency in the market is necessary to return good project developers to the market who are justifiably wary of the current state of the market.

Blockchain

“The immutability of transactions supports market integrity, and the distributed nature of the ledger supports transparency.”

World Bank

Blockchain has generated a lot of excitement in this space as a potential solution to some of these problems. As highlighted by the [World Bank](#): “The immutability of transactions supports market integrity, and the distributed nature of the ledger supports transparency”

It offers a cost-efficient way of creating contracts between actors, and provides a transparent secure method of recording transactions; both of these create issues in today's market. Diving into the topic more deeply, we spoke with Robert Greenfield IV, a [social impact blockchain author](#), who highlighted the need for a distributed ledger solution: “There are systemic imbalances in the market which blockchain could help resolve. Project developers generating credits aren't big enough to supply major companies. What is needed instead is a modular system which any project can plug into and where they can verify their offsets.”

Despite the hype that has surrounded blockchain solutions, it hasn't taken off in the way many expected. Mr. Greenfield attributes this down to two reasons: “Poor user experience and the wrong approach to market. The approach is particularly tricky. There is huge complexity between the compulsory and voluntary markets even before diving into the differences between registries.”



Another part of the problem has been the notion that blockchain can solve all of these problems alone. Blockchain can only achieve so much; complementing it with centralised data systems can unlock a deeper solution for the offsetting market. The recent World Bank Climate Warehouse [Simulation](#) on Connecting Climate Market Systems highlighted this need: “Analyses suggested that blockchain is not a suitable repository for storing large amounts of attribute information about climate actions. More extensive information, such as audit reports and detailed project information, should reside within a different type of data storage component. Furthermore, blockchain by itself does not assure data quality or integrity, and data entering the system needs independent quality assurance to ensure that it is reputable before entering the system. There should be processes and governance in place that dictate the format of information and its flow into the meta-registry.”

How the market evolves over the next few years is critical for global environmental efforts.

Post-Kyoto

2021 will see the end of the Kyoto Protocol, which formally created the CDM and instantiated the practice of carbon offsetting more widely amongst the international community. The voluntary market is somewhat insulated from the impact, with the Kyoto Protocol being more focussed upon compliance markets. Nevertheless, the end of Kyoto is a signal of something new: Paris. How international players decide to reshape offset markets under Article 6 of the Paris Agreement will impact not just the compliance market but the voluntary also.

Nova's Mr. Pauw highlights the sentiment amongst many project developers active in the voluntary market: "I'm still not sure what a post-Kyoto world is going to look like. I'm concerned about how countries are going to manipulate their NDCs through double counting. If double counting becomes a factor associated with the voluntary market – let's say I offset and then someone else doesn't have to – then the market serves no purpose. I am sceptical of how the post-Kyoto mechanisms will develop given how poorly the CDM has gone."

Whilst there is good reason to be cautious moving forwards, the implementation of new frameworks also present reasons to be optimistic. Policy makers have had 20 years to learn from the performance of Kyoto, and already we are seeing institutions like the World Bank proactively work towards improving future systems.

Startups in this space have excited us about the prospects of the market post-Kyoto. We have highlighted below several we feel are tackling issues in new and innovative ways.

Innovative startups



[Pachama](#) uses machine learning, satellite and LiDAR to verify and monitor forest carbon projects, whilst connecting project developers with offset buyers.



[Joro](#) uses a set of algorithms to develop an accurate estimate of the drivers of your carbon footprint, and then provides projects for you to offset your emissions via their app.



[Inhabit](#) is building a carbon offsetting community where people can also learn tips about how to reduce their impact and exchange ideas with like-minded individuals.



[Puro.earth](#) issues verified CO2 Removal Certificates (CORCs) on their platform, connecting carbon net-negative technologies with climate conscious companies and effectively creating a new registry for carbon offsets.



[Trine](#) allows individuals to invest in solar projects and earn a return on their investment, while also promoting clean energy.



[Nori](#) has developed carbon removals that not only negate one's footprint, but also supports sustainable farming practices.



[Climeworks](#) offers safe, efficient, permanent, and measurable carbon dioxide removal technologies where buyers can subscribe to remove up to 600kg of CO2 a year.

The current status quo is clearly not achieving the results we need to meet a 2 degree target, let alone 1.5 degrees. With new startups applying innovative solutions to address real and imminent problems, the post-Kyoto world stands a much greater chance of delivering the kind of change that is urgently needed.

What We Are Doing

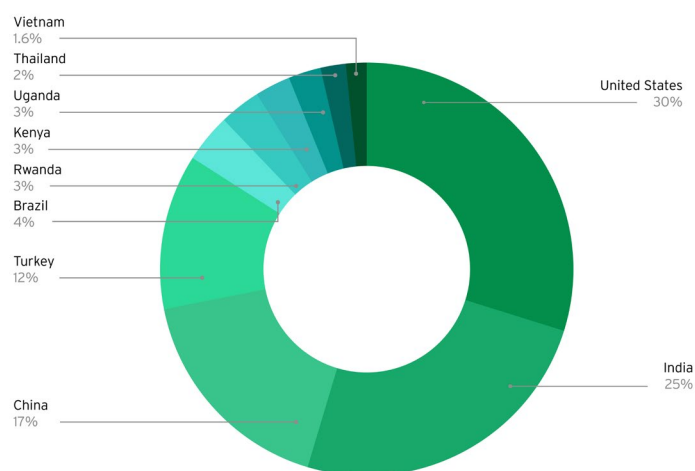
Keeping Track of Carbon Offsetting

At AlliedCrowds, we are bringing purchasers of offsets closer to the projects they fund with AlliedOffsets, the world's first database of carbon offset projects from multiple registries. Making use of our expertise in machine learning, we are creating a database to help remove the barrier between consumers and projects. The data comes from four leading voluntary registries, as well as the CDM, allowing people to compare projects in a more systematic way. Our use of AI will enable a new kind of data visualisation, allowing both consumers and developers to better understand the state of the market. No such visual guide to the market is open to the public, and we hope that this new platform will be transformative. It also paves the way for more direct access to the projects themselves. We believe that our database will open up new opportunities for researchers and analysts, leading the way for insightful work that further challenges the market to improve.

We have already begun to see the benefits of this new data. Here are some examples of the kind of analysis we have been able to unlock on the state of the market:

Share of the Market

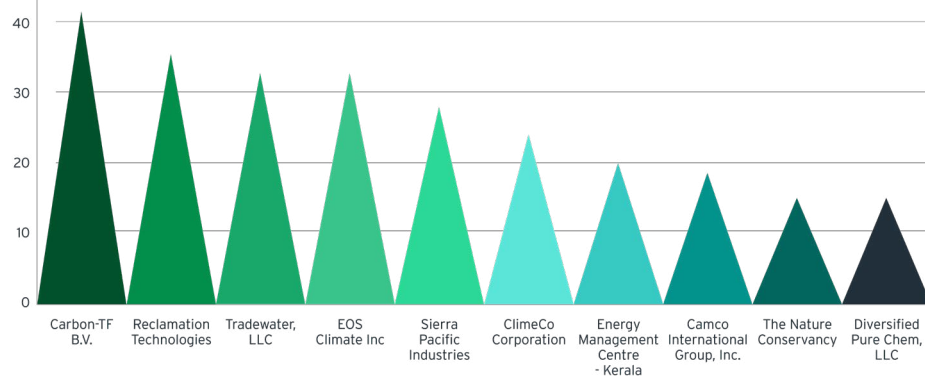
Voluntary Market - 10 Largest Nations



10 Most Active Project Developers

Voluntary Market

No. Projects Developed



Number of Countries Per Registry



Beyond this we are keen to leverage our existing capabilities to facilitate wider improvements in the market. One key area of difficulty is accessing up-front finance for project development. Currently the total cost of starting a project can range from \$200,000 - \$300,000. With no income from credits expected until at least 2-3 years after beginning the project, this is a serious barrier to entry for most potential project developers. With our background in crowdfunding, we are excited to see if we can apply our experience to support potential project developers currently locked out of the market. We are also exploring how we can interact with other emergent technological solutions in this space. With experience in blockchain from our work in remittance markets, we are well placed to integrate with distributed ledger technology solutions. We see blockchain as an important step in modernising post-Kyoto markets and helping create resiliency against the problems that have plagued the industry thus far.

We will continue to look into the data, improve our offering, and create innovative solutions to improve the market. If you'd like to work together, feel free to reach out to carbon@alliedcrowds.com in order to learn more!

Author: Kavir Borkhataria
Editor: Anton Root
Data Collection: Alex Athorne
Design: Elisabet Bassa

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